

SUSTAINABLE FINANCE REPORT

ISSUE #2



Responsible investment styles and
the regulatory environment

Measures to address climate risk
in investment portfolios

The search for yield and the
U.S. renewables sector

Developments and new horizons
for sustainable real estate

Diversification and the global
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- 58 countries representing over 85% of global GDP have implemented regulations or guidelines on sustainability reporting, ESG integration or exclusions¹
- 20% of all U.S. assets are managed with some form of ESG strategy²

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- Future climate risks could lead to economic shocks and losses of 23% for a fixed income portfolio and up to 45% for different equity portfolio investment styles³

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- The U.S. renewable sector employs 800K, with solar the fastest job creating sector. In comparison, the U.S. coal sector employs approximately 150K⁴

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- 71% of academic studies show a positive relationship between ESG and financial performance for real estate⁵
- 65% of a global model real estate allocation is to countries with strong green buildings’ policies⁶

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- 2.0 bn working adults, or almost half of the world’s total adult population, have no access to financial services⁷
- Economic activity in emerging market countries could be lifted by as much as 6% from broadening the access to financial services⁸

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There is no assurance that any assumptions or forecasts will come to pass. Past performance may not be indicative of future results.

¹ UN PRI’s global guide to responsible investment regulation (September 2016)

² USSIF U.S. Sustainable, Responsible and Impact Investing Trends 2016 (November 2016)

³ Cambridge Institute for Sustainable Leadership (November 2015) Unhedgeable Risk

⁴ International Renewable Energy Agency, U.S. Bureau of Labor Statistics

⁵ Deutsche Asset Management, University of Hamburg (December 2015) ESG & Corporate Financial Performance

⁶ Deutsche Asset Management, Baker & McKenzie (March 2016) Global Sustainable Buildings Index

⁷ The Global Findex Database 2014, Measuring Financial Inclusion around the World

⁸ McKinsey Global Institute (September 2016) How digital growth can boost growth in emerging economies



EXECUTIVE SUMMARY
JUNE 2017

Germany has an opportunity to move center stage in the area of green finance in 2017 given the German G20 Presidency summit in Hamburg in July, the PRI's annual investors' summit in Berlin in September and the COP23 international climate finance negotiations in Bonn in November.

With this in mind, the second issue of the Sustainable Finance Report examines how activity in sustainable investing is gathering momentum. We examine key trends such as asset owner demands, fiduciary duty, regulatory requirements and climate change.

Part of the reason for the increasing importance of ESG originates from growing academic evidence and investor experience that shows incorporating ESG into investment decision-making can improve performance and reduce risk¹.

To address these themes, the first article in this report examines how the regulatory environment is affecting the ESG investment landscape. Typically legislation has focused on corporate disclosure, stewardship codes and regulation aimed specifically at asset owners. The fact that the number of laws as they relate to climate change has also doubled every five years since 1997 reveals why investors are placing increased scrutiny on their holdings of carbon intensive securities.

Increased mandatory reporting and disclosure requirements are also taking place at a corporate and investor level. The Financial Stability Board's Taskforce on Climate-related Financial Disclosure has developed proposals for assessing exposure to physical climate change risks, liability risks and how asset valuations might be affected by low-carbon government policies. Germany's G20 Presidency in 2017 is likely to consider how the proposals from the Financial Stability Board's Task Force on Climate-related Financial Disclosure could eventually become mandatory for companies and investors, which would extend the reach of ESG investing.

Given the importance of assessing and addressing climate risk in an investment portfolio, the second featured article in this report examines the various routes open to investors with exposure to carbon intensive assets. Here, we examine fossil fuel divestment campaigns, investor engagement as well as hedging portfolios via low carbon investments.

Asset owners are also becoming increasingly forceful in their objectives and, in many instances, are adopting low carbon commitments. For some, this is not just reducing the carbon footprint of their portfolios, but, more importantly increasing their investments in clean technology, green infrastructure and green bonds. In recent years, China and the U.S. have led the world in clean energy investment. We examined prospects for China's renewable sector in the first issue of the

Sustainable Finance Report published last year. Consequently in the third featured article of this report we examine prospects for the U.S. renewables sector in light of the U.S. Presidential election results.

In the fourth featured article we also assess developments in the global real estate market, which, in our view, is the asset class with amongst the strongest reasons for incorporating sustainability. This stems from the strong link with financial performance, developments in the areas of investor requirements, government policies, tenant demand and the growth of smart data technologies.

Our final article is an introduction to the global microfinance sector and the broader ambitions of financial inclusion. With its roots in Bangladesh in the early 1970s, the sector has grown significantly in recent years in part due to microfinance's portfolio diversification properties. In addition, universal access to financial services is viewed as part of the solution to many of the Sustainable Development Goals signed in New York in September 2015 including ending poverty, ending hunger and gender equality.

This report therefore provides a snapshot of the multiple factors driving the growth in sustainable and ESG investing, which we expect will gather momentum in 2017 through growing investor interest and heightened regulatory activity.



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References

Sustainalytics, Cass Business School (June 2016)
Engagement: Unlocking the Black Box of Value Creation

Dimson, E. Karakas, O. and Li, X. (2015) Active Ownership.
The Review of Financial Studies, 28(12) pp. 3225-3268

Past performance may not be indicative of future results.

¹ For more details see Issue #1 of the Deutsche Asset Management Sustainable Finance Report and the article ESG & Corporate Financial Performance: Mapping the global landscape, Deutsche Asset Management (December 2015)
[https://institutional.deutscheam.com/content/_media/K15090_Academic_Insights_UK_EMEA_RZ_Online_151201_Final_\(2\).pdf](https://institutional.deutscheam.com/content/_media/K15090_Academic_Insights_UK_EMEA_RZ_Online_151201_Final_(2).pdf)



**RESPONSIBLE INVESTMENT
STYLES AND THE REGULATORY
ENVIRONMENT**

Europe and the U.S. represent over 90% of ESG assets under management globally. ESG investment styles in Europe are dominated by exclusions and norms-based screening while in the U.S. ESG integration predominates. To a large extent these styles have been encouraged by voluntary codes, principles and fiduciary duty. However, mandatory legislation is also on the rise as illustrated by divestment bills in California and newly mandated reporting requirements in France. In this article, we explore these trends and ponder how a new Republican administration in the U.S. will affect the fivefold increase in retail and institutional funds incorporating climate change into their investment criteria that has occurred in the U.S. over the past two years.

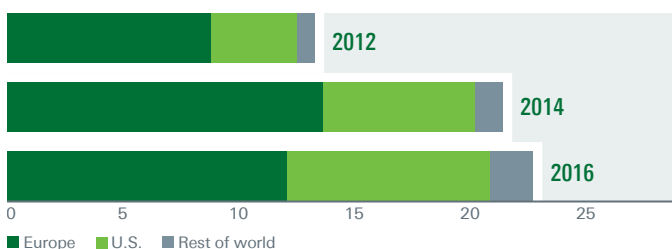
Executive summary

Investors have become increasingly aware of the importance of such issues as climate change, resource scarcity, labor rights and corporate governance to financial returns. We believe this helps to explain the growth in assets under management (AuM) that are classified as Environmental, Social and Governance (ESG).

In this article, we examine trends in ESG AuM and their various classifications. We then consider how these responsible investment strategies have been influenced by the adoption of voluntary codes and principles by asset owners and managers as well as the increasing scope and pace of mandatory legislation.

The latest data from the Global Sustainable Investment Association (March 2017) shows that ESG investing grew 25% over the past two years to reach USD 22.89 bn. In the U.S., ESG assets at the beginning of 2016 had risen by 33% year-on-year to reach USD 8.72 tn. As a result, ESG AuM in the U.S. now represents over 20% of all assets under professional management, an increase from 11% since the 2012 USSIF survey.

Figure 1: AuM classified as ESG by region (USD tn)



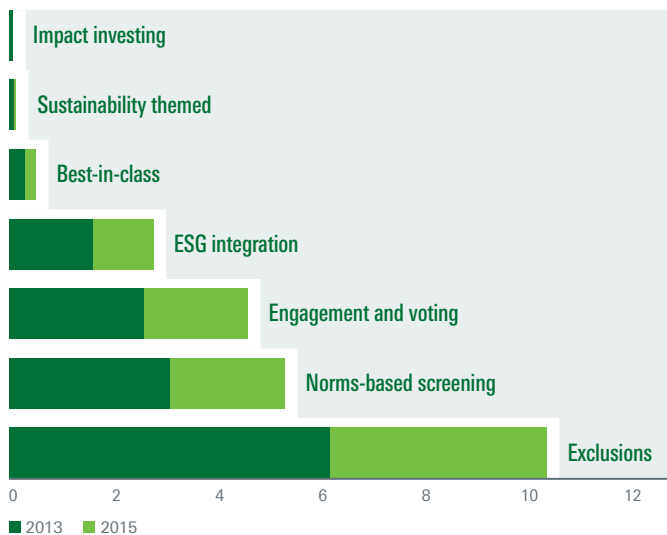
EU-13 data for end 2015 data are not fully comparable to the previous survey in 2013 as Norway is now not included
Sources: GSIA (2014); Eurosif 2016; USSIF 2016; RIAA 2016

Compared to other regions, Europe had the slowest growth of ESG assets over the past two years (12%). In Europe, exclusion strategies predominate though sustainability themed and impact investing had the highest growth rate. The highest ESG growth rate occurred in Japan (GSIA March 2017).

From the types of investment styles deployed, we find exclusion screens, norms-based screens and engagement

and voting are the most prevalent in Europe, Figure 2. These styles have been spurred on by voluntary codes and principles such as the U.S. Global Compact and the Principles for Responsible Investment.

Figure 2: European ESG investment styles classified by AuM (EUR tn)*



* Note that if a fund combines two or more ESG strategies then they will be accounted for in each strategy, but, only once in the overall figures outlined in Figure 1; Data as of end December 2015.
Source: European SRI Study 2016, Eurosif (November 2016)

The predominance of exclusionary screens in Europe, that is prohibiting certain sectors or companies involved in activities or industries deemed unacceptable or controversial from a fund or plan, has, in part, been encouraged by mandatory legislation prohibiting the investing in companies focused in the manufacturing and production of cluster munitions and anti-personnel mines (CM&APL).

Mandatory legislation in this area exists across a number of countries, including Belgium, Ireland, Italy and New Zealand. According to Eurosif data, voluntary exclusions in investments in CM&APL account for 80% of total exclusions in Europe when measured by AuM. The remaining exclusion screens encompass such sectors as tobacco, nuclear energy, gambling and animal testing.

Past performance may not be indicative of future results.

¹ CFP measures are defined as accounting-based performance, market-based performance, operational performance, perceptual performance, growth metrics, risk measures and the performance of ESG portfolios. Portfolio studies comprise of studies on long-short ESG portfolios and in particular studies on ESG mutual funds and indexes.

The European Parliament approved in November 2016 the Institutions for Occupational Retirement Provision directive which requires European occupational pensions above a certain size to consider how ESG risks are incorporated into the investment process.



The rising tide of regulation

When it comes to responsible investment, regulation is typically centered around four themes:

- 1 | Corporate and investor disclosure such as the EU non-financial disclosure directive
- 2 | Stewardship codes and laws which encourage asset managers to engage with their investees
- 3 | Regulations aimed specifically at requiring asset owners to incorporate sustainability factors into their investment decision-making
- 4 | Regulations to shift capital to green and sustainable assets

1 | Corporate disclosure

Efforts to improve corporate disclosure are spreading around the world with many initiatives such as the International Integrated Reporting Council (IIRC) an example of this trend. In fact 19 countries from the G20 have implemented regulation or guidelines on sustainability reporting, exclusions and ESG integration.

- In an effort to standardise ESG disclosure, the [U.S. Sustainability Accounting Standards Board](#) is developing accounting standards for more than 80 industries across 10 sectors. This is supporting the Securities and Exchange Commission's Regulation S-K, which includes annual financial reports, which requires that certain sustainability-related information be disclosed.
- In the [European Union](#), the [Non-Financial Reporting and Diversity Directive](#) became effective at the beginning of 2017. It requires certain public and private companies to

disclose information on ESG as well as human rights, anti-corruption, bribery and boardroom diversity. To some degree it builds on Germany's Sustainability Code which requires companies to disclose their compliance against 20 ESG criteria on a comply-or-explain basis.

- More powerful still is the [French Energy Transition Law](#), ratified at the beginning of 2016 and effective from the beginning of this year, which has both obligations for companies and investors. From a listed company perspective it requires the disclosure of the financial risks related to climate, mitigation efforts, and consequences of climate on its goods and services.
- The integration of sustainable development into the financial system is also underway via central banks, financial regulators, credit rating agencies and stock exchanges among others.
- The [World Federation of Exchanges \(WFE\)](#) has ESG recommendations and guidance for its members and specifically recommends 34 key indicators that can be incorporated into stock exchange listing disclosures.
- The [Global Reporting Initiative \(GRI\) Sustainability Reporting Guidelines](#)¹ provide a framework to assist listed companies towards greater transparency. The framework, incorporating the G4 Guidelines, sets out the principles and indicators that organizations can use to measure and report their economic, environmental, and social performance.
- A good example of sustainability reporting is the [King Code in South Africa](#). This principle based code for corporates has been adopted by the Johannesburg Stock Exchange as a listing requirement. The code is now being adapted for application to retirement funds in addition to corporates.

We expect this process of corporate reporting will be enhanced by the work being conducted by the Financial Stability Board's Task Force on Climate-related Financial Disclosure. One of its aims is to facilitate the voluntary disclosure of reliable, comparable and consistent forward looking climate-related financial data for companies and all parts of the financial sector, including banks. These recommendations will be presented to the G20 under Germany's presidency, with the possibility that these voluntary measures could become mandatory in a few years time.

2 | Stewardship and responsible ownership initiatives

The aim of stewardship codes is to promote the sustainable growth of companies through investment and dialogue. For investors, stewardship is more than just voting. Activities may include engagement on topics such as strategy, risk management, capital structure and corporate governance including board compensation and remuneration.

The adoption of stewardship codes has occurred in countries such as the U.K. and Switzerland, but, also further afield in Japan, Taiwan and Brazil. These codes have been driven in large part by institutional investors' fiduciary duty, which is demanding greater shareholder activity and active ownership as part of integrating ESG factors into the investment process.

We are also seeing increasing guidance when it comes to fiduciary duty. We expect this will continue to promote engagement and proxy voting activities. For example, the U.S Department of Labor's ERISA ruling in September 2015. The Employee Retirement Income Security Act (ERISA) overturned their previous 2008 guidance and now permits fiduciaries to consider ESG factors in the investment process.

The EU Shareholders' Rights Directive is also working in the direction of enhancing active engagement activities. This will encourage listed companies within EU member states to strengthen the rights of shareholders as well as shareholder responsibilities with the ultimate aim of enhancing the sustainability of EU companies.

3 | Asset owner regulations

When measured by AuM, 14 of the largest 20 pension funds in the world are now signatories to the UN supported Principles for Responsible Investment (PRI). This is placing an increasing scrutiny on global investors in the area of responsible investing. According to Asset Owners Disclosure Project, 10% of the world's 500 largest investors—including pension funds, insurers and sovereign wealth funds—are measuring carbon in their portfolios.

Activity in terms of carbon or broader ESG reporting has typically been voluntary for asset owners and managers. These include the Montreal Pledge and the Portfolio Decarbonisation Coalition which respectively commit to measuring the carbon footprint of portfolios and then committing to reduce the carbon intensity within portfolios. However, legislation is emerging which is placing increasing demands on asset owners and managers.

In **Europe**, the European Parliament approved in November 2016 the Institutions for Occupational Retirement Provision directive. This will require European occupational pensions above a certain size to consider ESG and how ESG risks are incorporated into the investment process. This Directive must now be transposed into Member State law by November 2018 at the latest.

The **Energy Transition Law in France** means that it is the first country in the world to require the mandatory disclosure by institutional investors of how they are managing climate related risks as well as how they are assisting in the energy transition to limit global warming to 2°C. French asset owners are therefore likely to request that all their asset managers, including those that operate outside France, report according to French requirements.

In the **Netherlands**, the pension fund code requires pension funds to define a responsible investment strategy and disclose it publicly. In addition, the Dutch central bank is also examining how asset owners and managers integrate climate risk into their investment decisions.

There is also a good chance of **further European proposals** in these areas. For example, the new EU Director General for capital markets union has, at the beginning of this year, established an expert group to start work on recommendations in this area.

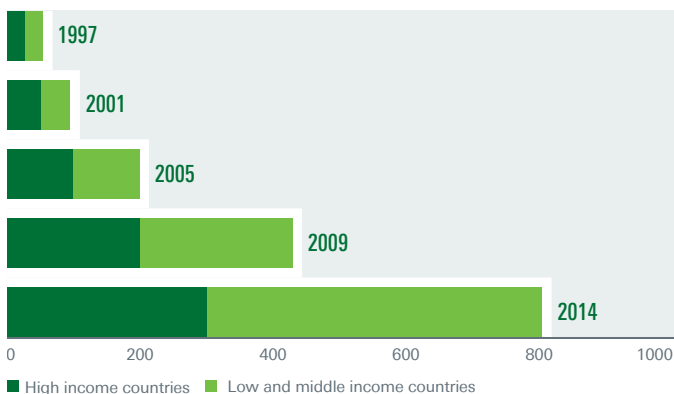
In **Australia**, the Standard on Superannuation Governance Policy requires members of the Financial Services Council to develop an investment policy stating how ESG issues are addressed, including a risk management policy.

4 | Green and sustainable investment regulations

Although small in terms of overall AuM, sustainability themed investing has traditionally been one of the fastest growing ESG investment styles in terms of AuM. Typically sustainability themed funds are related to energy efficiency and renewable energy as to a large degree fund development in this area has been driven by climate legislation. From a regulatory perspective, the past 20 years has witnessed the increasing scope of climate change mitigation and adaptation legislation. Indeed according to the 2015 Global Climate

Legislation Study the number of laws passed globally relating to climate change has doubled in every five year period since 1997, **Figure 3**. It is also noteworthy that the past few years has seen a levelling off in the number of countries introducing new legislation, perhaps indicating a greater focus on implementation of climate legislation.

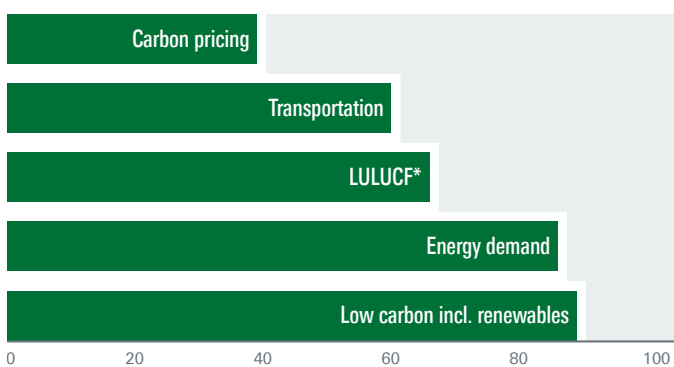
Figure 3: Number of laws passed relating to climate change mitigation and adaption across 99 countries



Figures relate to end year for the respective data points
Source: The 2015 Global Climate Legislation Study (May 2015)

From a thematic standpoint, **Figure 4** shows the number of countries that have passed laws focused on a specific theme or sector. We find low carbon and energy efficiency measures have typically been the main focus of climate legislation around the world.

Figure 4: Number of countries that have passed laws as they relate to sector and theme



* Land use, land use change and forestry
Source: The 2015 Global Climate Legislation Study (May 2015)

The importance of climate legislation is also captured in the recent USSIF survey which shows that U.S. climate change focused funds have grown fivefold to reach USD 1.42 tn AuM between the beginning of 2014 and 2016. As a result, climate change is the most significant environmental factor in the U.S. when measured in terms of assets. Part of this reflects the increasing proliferation of fossil fuel restrictions and/or outright divestment policies. The fossil fuel divestment campaign in the U.S. has been given added impetus by state level legislation in the U.S. For example, in October 2015, California state legislature ratified legislation that instructs public pension funds in the state to divest holdings in companies that generate at least half of their revenue from coal mining by July 2017.

With many U.S. states adopting targets to source an increasing share of their energy mix with renewables, this divestment trend may still continue despite the uncertainties thrown up by the new President-elect and the Federal government’s future commitment to reduce emissions. Indeed we expect international agreements such as the Paris climate deal and the UN Sustainable Development Goals (SDGs) will continue to spur the ongoing growth in sustainability themed funds such as delivering clean energy to households across sub-Saharan Africa.

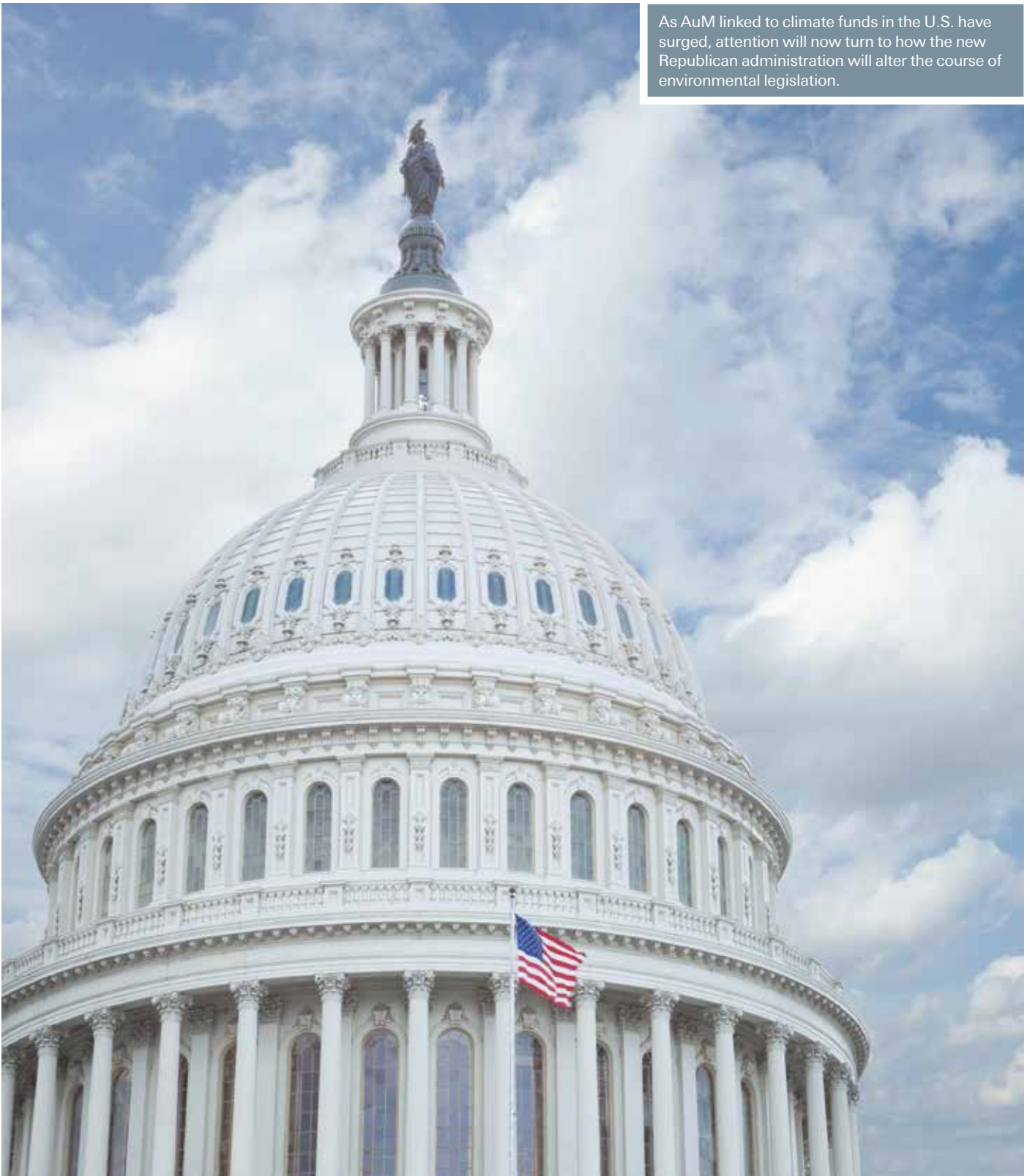
Conclusion

A quiet revolution has been underway in the responsible investment arena for over a decade. Its imprint is seen in the growth in various ESG investment styles. In many instances these have been driven by voluntary codes and principles. However, in recent years ESG legislation is becoming more widespread and impactful.

Good examples of this include the coal divestment bills in California, France’s new energy transition law, the rise of stewardship codes around the world not to mention more legislation in the pipeline. These trends demonstrate the increasing forcefulness of ESG investing from a regulatory perspective.

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As AuM linked to climate funds in the U.S. have surged, attention will now turn to how the new Republican administration will alter the course of environmental legislation.



References

Eurosif, European SRI study 2016 (November 2016)

Global Reporting Initiative, G4 Sustainability Reporting Guidelines (August 2015)

Global Sustainable Investment Alliance, 2014 Global Sustainable Investment Review (February 2015)

Global Sustainable Investment Alliance, 2017. Global Sustainable Investment Review (March 2017)

LSE, Grantham Institute, The 2015 Global Climate Legislation Study, (May 2015)

Principles for Responsible Investment, MSCI, Global guide to responsible investment regulation (September 2016)

Responsible Investment Association Australasia, Responsible Investment Benchmark Report 2016 (July 2016)

USSIF, 2016 Report on Sustainable, Responsible and Impact Investing Trends (November 2016)



**MEASURES TO ADDRESS
CLIMATE RISK IN
INVESTMENT PORTFOLIOS**

Climate change and inter-related environmental issues have consistently been on (and have risen up) the World Economic Forum's Global Risks Report. Currently, we believe the response to climate change may be viewed as an attractive investment opportunity across all sectors and asset classes.

Executive summary

An important factor driving the interest in sustainable investments and Environment, Social and corporate Governance (ESG) factors more broadly, is the portfolio risks associated with climate change.

In this article we provide an overview of the nature of climate risk, including developments in measuring and managing these risks such as engagement and divestment.

Climate risk has moved to the top of the agenda for policy-makers and regulators, driven by the Bank of England Governor's speech in September 2015 which identified that physical, legal and regulatory risks make climate change a threat to financial stability. As a result, it is becoming ever more important for investors to understand and, where possible, to start managing their climate risks.

Under Germany's G20 Presidency in 2017 one of the key initiatives will be to discuss the recommendations of the Financial Stability Board (FSB) Task Force on Climate-related Financial Disclosure, which include stress-testing if business plans align with the Paris Climate Agreement.

While the low-carbon transition will move at different speeds, we believe that all governments will have to enact more stringent policies in legislation and that the cost of doing so is lower if action is taken sooner.

Despite the uncertainty of the new U.S. government's approach to climate and energy policies, we believe it is investors' fiduciary duty to measure and ultimately reduce climate risks. Given investors' long-term perspective, they should focus beyond political cycles. If some regulators do not support implementation of the FSB Task Force's recommendations, we expect investors could make greater use of proxy voting and engagement to improve corporate disclosure, as well as trying to persuade stock exchanges and accounting standards to eventually require climate risk disclosure.

Physical climate risks already exist and are only likely to grow over time. Despite scientists' sophisticated climate models, physical climate risk data needs to become more available for investors and linked to companies' facilities and supply chains. Improved supply chain risk analysis could be created

by enhancing the FSB Task Force recommendations to require disclosure of '1 in 100' year, '1 in 20' year and annual disaster risk exposure. Improved disclosure of most at risk and important company facilities may also be needed, while maintaining security and confidentiality. Improved disclosures linked to climate models will become increasingly important for many types of investors.

Legal risks include attributing the increased strength of individual extreme weather events to climate change and seeking penalties from the largest carbon emitters. Investors could also become liable for insufficiently managing climate risks. The history and magnitude of asbestos related liabilities is a cautionary case study.

Regarding transition risks, while currently prevailing carbon prices appear low, many observers were surprised that governments managed to reach the Paris Climate Agreement and that it became international law so quickly. Investors should be prepared for rapid policy changes and the possibility of an abrupt re-pricing of asset valuations. Some investors may believe that economic impacts will not appear over the next few years or that they will be able to exit any at-risk holding with sufficient foresight. However, a recent study for a group of major investors shows that markets could abruptly re-price climate risks which could reduce returns over the next five years by 11% to 45%, depending on the portfolio allocation (CISL Nov. 2015).

Measuring portfolio carbon intensity has been a starting point, but, this fails to capture the entire picture. Improved disclosure, robust analysis and new indexes are needed that account for sectoral differences and all climate risks. To truly address climate risks, asset owners and managers need to incorporate climate and other ESG issues into their investment beliefs and processes. Topics for discussion include stress-testing and creating low-carbon investment targets and risk reducing benchmarks.

The fossil fuel divestment campaign has played a key role in putting climate change more firmly on the agenda of investors, governments and carbon intensive companies. More investors are divesting some or all of their fossil fuel assets but many others are more inclined to favour engagement and climate/ESG integration.

In 2016, a number of leading investors became increasingly vocal and active in engaging carbon intensive companies and governments. This led to several European energy and mining company boards’ supporting shareholder resolutions that called for improved carbon risk management and stress testing. Investors also played an important role in the adoption of the Paris Agreement. Policy engagement is therefore becoming an increasingly important role for investors.

We are seeing a growing trend towards strong ESG and climate related proxy voting, more proactive engagement with companies and policy makers as well as the consideration of selective divestment (not just with carbon intensive companies) if corporate investees do not sufficiently improve their climate and ESG practices.

U.S. research shows that engagement on climate change, environmental and corporate governance issues can improve companies’ performance and reduce volatility (Dimson et al Aug 2015). Engagement with companies and policy-makers can lead to important changes, but there is over-reliance on a few active and vocal investors. Meeting fiduciary duties will require asset owners, asset managers and regulators to live up to their stewardship responsibilities by encouraging companies and governments to shift their strategies to reduce climate and ESG risks and seize opportunities. The EU Shareholder Rights Directive and other regulations are likely to lead to more focus on engagement.

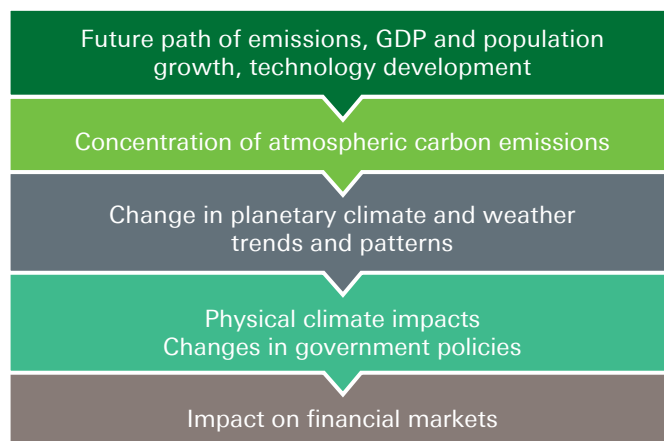
The growing shift to passive and exchange traded funds is a challenge to engagement strategies. Asset owners, managers and regulators are likely to look for ways to expand the level and quality of investee engagement on climate and ESG issues, including in passive funds. Investors are also increasingly seeking out investment opportunities in green revenue streams. It is therefore becoming a necessity for every major asset class to consider climate risk and low-carbon technology investment options.

1 | Explaining climate risks

The link between climate risk and financial stability is becoming an ever more important consideration for long-term investors, companies and governments. The Bank of England has classified climate risk as including physical risks, liability risks and low-carbon transition risks.

To understand climate risks, an appreciation is needed of the connection between carbon emissions and societal impacts, **Figure 1**. Each the the factors shown in Figure 1 is subject to their own particular levels of uncertainty. However, the growing annual flow of carbon emissions increases the stock or concentration of emissions in the atmosphere. This is causing a sustained and unequivocal increase in global temperatures which are causing changes around the world (IPCC 2014).

Figure 1: Connection between emissions and impact on financial markets



Source: Deutsche AM analysis, Dec 2016

Without further emission reductions, global average temperatures could rise to more than 4°C above what they were before the industrial revolution. While this may not sound significant, the last time there was a temperature difference this large in human history (4°C colder than today) was twenty thousand years ago when glaciers covered much of North America and northern Europe. The most important parts of human civilization (starting with the domestication of cattle 11,500 years ago) existed in a moderate and relatively stable temperature band. Even if emissions were to cease tomorrow, the climate would continue to change due to the stock of carbon emissions in the atmosphere. An additional risk is that some climate systems and ecosystems could cross tipping points or critical thresholds which could create irreversible changes— though there is debate about whether or when this could happen (IPCC 2014).

We believe that it is exceedingly risky to follow a path that leads to temperatures becoming much higher than those that have prevailed through thousands of years of human history.

Increasing recognition that climate change is a significant threat, helped lead almost every government in the world to reach a new global climate agreement in December 2015 (see **Box I—Paris Climate Agreement**).

The case for action on climate change is broader than just avoiding negative impacts. An estimated USD 90 tn investment in cities, energy and land-use systems is projected to be made over the next 15 years. A prominent group of business and international leaders and top economists have persuasively made the case that it is the nature of these investments that will determine our future growth and prosperity as well as the level of climate change (i.e. low or high carbon energy systems, smart/compact cities or urban sprawl). Many of the policy and institutional reforms needed to revitalise economic growth and improve well-being will also reduce climate risks as well as creating significant benefits such as improved air quality (New Climate Economy 2014).

Box I: What is in the Paris Climate Agreement?

A long term target: “Hold the increase in the global average temperature to well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels” (UNFCCC 2015). Countries agreed “to reach global peaking of greenhouse gas emissions as soon as possible, recognizing that peaking will take longer for developing countries, and to undertake rapid reductions thereafter”. The aim is to achieve in the second half of this century, a “balance” between emissions and emissions absorbed by forests, oceans and injected into geological formations using carbon capture technologies. This is a global carbon neutrality goal.

Scaling up effort in the future: countries agreed to a ‘stock-take’ of progress in 2018 and to commit to set new, more ambitious targets every 5 years starting in 2023.

Nationally set targets: 190 countries covering 98.9% of emissions set their own targets (Nationally Determined Contributions-NDCs)—much more than the 1997 Kyoto agreement which covered 11% of emissions (WRI 2016).

Compliance: the Agreement has no penalties. However, action will be encouraged by international pressure as countries have to disclose their progress and this will be reviewed by experts. Action is also supported by the domestic political processes that led to 190 national targets being set. Growing numbers of national and local governments are realising the risks of not acting and are intending to seize the economic, health, employment and other co-benefits of a low-carbon economy.

Physical risks

Physical climate impacts can range from water stress and cropland decline to river flooding and heat-waves with potential disruptive effects on property and trade flows. **Figure 2** presents estimates of the degree to which physical risks can affect the global population and cropland under different climate action scenarios, with no action to address climate change inflicting the greatest potential damage.

Figure 2: Potential physical climate impacts

Physical risks	No action	Paris Pledged policies	Additional policies for 2°C
Water stress Billions of people exposed	1,921	1,700	1,425
Cropland decline Thousand km ²	7,604	5,704	4,508
River flooding Millions of people	145	86	58
Heatwaves Millions of heatwave incidents experienced	12,184	4,506	1,387
Sea level rise Millions of people affected	627	432	280

Source: Avoid2 2015, Strauss et al 2015

At a macro-economic level, the Economist Intelligence Unit and Vivid Economics (2014) estimated that the current value at risk from climate change without sufficient action is USD 4.2 tn. This is roughly the total value of the world’s publicly listed oil and gas companies or the entire GDP of Japan.

The most scientifically reviewed report in history, the Inter-governmental Panel on Climate Change (IPCC 2014) concluded in part that “climate change is projected to increase displacement of people...[and] can indirectly increase risks of violent conflicts in the form of civil war and inter-group violence by amplifying well-documented drivers of these conflicts such as poverty and economic shocks”. A global temperature increase of 4°C or more could “create severe and widespread impacts on unique and threatened ecosystems, substantial species extinction, large risks to global and regional food security”. The difference between a 1.5°C warmer world and 2°C warmer is significant, **Figure 3**. The IPCC will publish a report in 2018 on the implications of the 1.5°C target.

Figure 3: Impact of 1.5°C vs. 2°C warming in 2100 relative to 2000

	1.5°C warmer	2°C warmer
Freshwater availability in the Mediterranean	↓ 9%	↓ 17%
Heavy rainfall intensity	↑ 5%	↑ 7%
Wheat production	↓ 9%	↓ 16%
Maize production	↓ 3%	↓ 6%
Soy production	↑ 6%	↑ 7%
Sea level rise	137 million people at risk	280 million people at risk
Coral reefs at risk of bleaching	90% at risk	98% at risk

Source: Schleussner et al April 2016, Strauss et al 2015

There is a very narrow window for staying within the 1.5°C target. If emissions stay at their current level, in 5 years humanity will have used up the carbon budget associated with having a 66% chance of keeping global warming within 1.5°C or 9 years if we accept a 50% chance (Carbon Brief May 2016). If emissions are reduced, then the possibility of staying within this target improves.

Essentially climate change is shifting the probability distribution of the earth’s weather patterns so that tail risks become larger. We are “loading the climate’s dice”.

We next review how the insurance industry and wider financial sector could improve its resilience to physical risk.

Starting in the 1980s, a growing number of large natural catastrophes created a crisis for the re/insurance industry. Insurance company insolvencies and the withdrawal of

private capital in the early 1990s led to natural disaster insurance and re-insurance becoming unavailable, severely restricted or excessively expensive (Douglas 2014).

Over the next decade, the re/insurance sector worked to address the crisis by transforming how natural disaster risks are managed. The insurance industry’s problems were solved by a combination of improvements in scientific data and analytical capacity, smart investors who demanded that underwriters improve how they evaluate and price disaster risks and insurance regulators who required insurance companies to have sufficient capital to deal with the worst combination of extreme events across the world that might occur once in every 200 years. Now, the insurance industry is able to handle ever larger insurance claims. Over USD 120 bn of claims were made in 2011, the worst year of natural disasters on record.

The ability of the insurance sector to improve and manage extreme physical catastrophes is encouraging. However, a large proportion of the world does not have any access to insurance. As well, the financial sector outside of the insurance industry does not account for natural disaster risks: it is not factored into valuations, creditors do not assess risk in loan books and even in risky locations the real estate market largely ignores disaster risk.

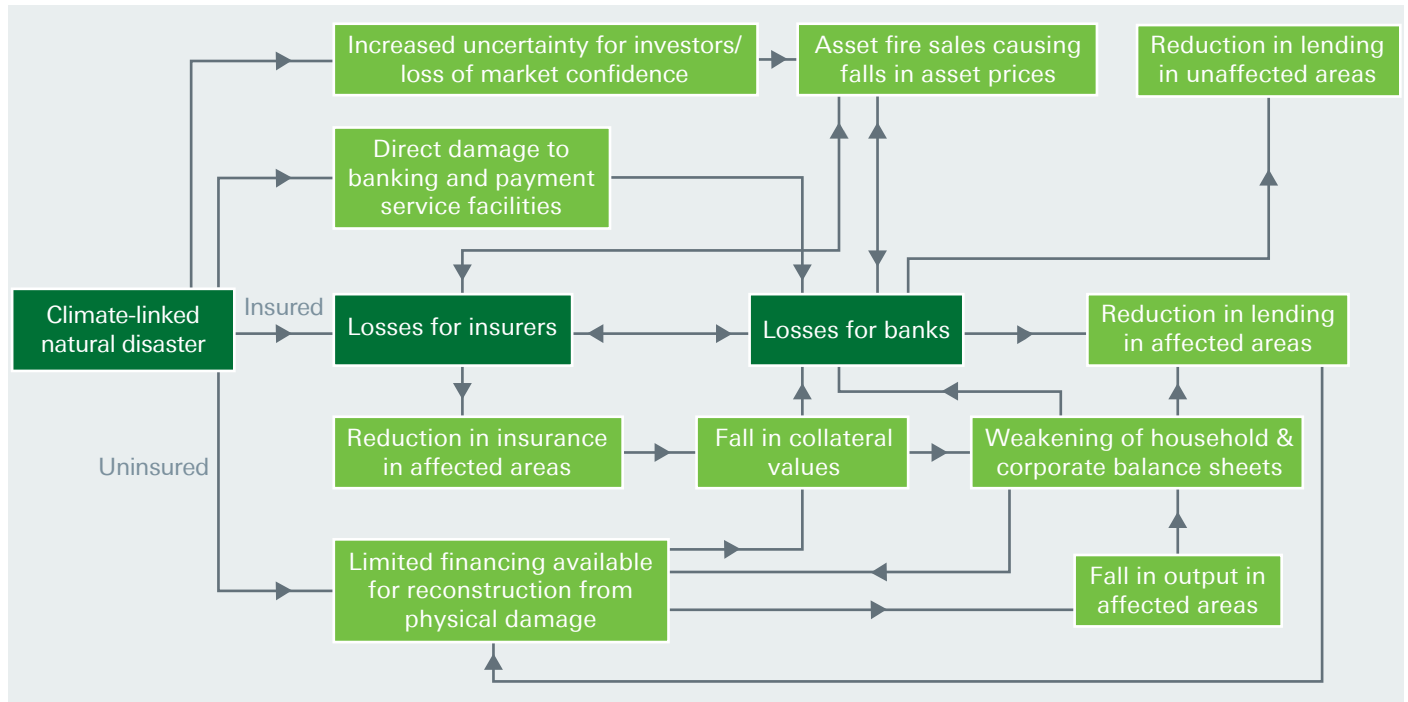
Rowan Douglas, the Chief Executive of the Capital, Science and Policy practice of the advisory and insurance broking and solutions company Willis Towers Watson, is leading an effort to integrate physical climate risks into the financial system. He helped create the “1 in 100” initiative which is encouraging regulators and investors to encourage and/or require listed companies to disclose their maximum probable annual losses for a 1 in 100 year disaster, a 1 in 20 year disaster and their average annual disaster losses. Disclosure of these basic metrics helped the insurance industry to recover after the crisis of the 1990s.

We believe the ‘1 in 100’ initiative’s aims could allow investors and banks to incorporate companies’ physical climate vulnerability into investment/financing decisions. At present it is difficult to obtain information on how companies (particularly their supply chains) are at risk of natural disasters. Therefore we hope governments and climate scientists will improve disclosure and data availability for investors. Policies could also help companies assess and disclose their risks. For instance, the UK Climate Change Act requires public and private sector critical infrastructure providers (such as transport and utility companies) to assess and report on physical climate risks (CCC 2016). Disclosure could be factored into financial decisions.

The Bank of England held a seminar in November 2016 to examine climate and sustainability issues for central banks. Several Bank of England experts presented their view of how physical change disasters could lead to losses across the financial sector, **Figure 4**.

We suggest that the economic opportunity cost of disasters (i.e. diverting spending to reconstruction) should also be accounted for. Physical risks justify government climate policies and require risk management.

Figure 4: Potential propagation of natural disaster impacts on the financial sector



Source: Tanaka et al. Nov. 2016
The example shown is for illustrative purposes and does not represent any particular investment.

Liability risks

Liability risks could arise as those who have or will suffer losses or damages due to climate change could seek compensation from those they hold responsible—i.e. the largest carbon emitters and potentially financial sector actors who have facilitated “polluters” business activities.

Investors and other financial institutions could also face legal liability risks. Mercer (Nov 2015) concluded that Australian pension fund trustees could be exposed to potential liability for failing to take account of climate risks. Two UK barristers have published an opinion that pension fund trustees could be exposed to legal challenge for failing to consider climate risks (ClientEarth Nov 2016). This makes it prudent for trustees to consider and manage climate risks as part of their investment process.

Governor Mark Carney’s September 2015 speech cited the potential for insurance companies to be impacted by “uncertain and non-linear, long-tail risks”. Carney noted that asbestos claims in the U.S. cost insurers USD 85 bn or three times the losses of Super-storm Sandy in October 2012. Such risks will increasingly impact insurers’ asset values.

“Loss and damage” is an element of the international climate policy discussions as some countries (particularly low-lying island states that could disappear due to sea-level rise) are seeking compensation from developed countries and potentially from large corporate emitters, including through the courts (UNFCCC 2013).

Scientific advances appear to be increasing the liability risk as the field of ‘attribution’ is demonstrating how climate change can be attributed to making an individual extreme weather event more frequent or severe. One law firm asserted (BNA 2016) that **it is only a question of when a next wave of climate-based civil action and litigation will occur and that improvements in attribution science will change the legal landscape.**

As the regulator of the UK insurance industry, the Prudential Regulatory Authority (PRA Sept 2015) published an assessment of the insurance industry’s exposure to climate risks. Regarding liability risks, the PRA concluded that *“past experience in areas such as asbestos and pollution indicates that although initially it may be difficult to get traction in the courts, a growing scientific consensus combined with increasing litigation eventually leads to substantial claims...legal action ‘failure to mitigate’ [i.e. to reduce emissions] may succeed in a developing country with possibly more activist courts within the next decade, particularly as evidence relating to both the foreseeable nature of risks and attribution of climate change to carbon-intensive activities continues to strengthen”*. Legal claims related to a company’s ‘failure to adapt’ or ‘failure to disclose’ could succeed under existing laws.

A harbinger of what could be a new wave of climate litigation is a successful lawsuit in 2015 in the Netherlands which requires the government to increase the stringency of their climate policies. The courts decided that Holland must cut their emissions by at least 25% compared to 1990 levels within five years (their policy was for a 14-17% reduction). The decision is being appealed but similar litigation appears to be underway in other countries (Urgenda 2015).

Transition risks

Transition risks relate to the increasing scope of climate change regulation, the associated costs this will create, whether companies are adequately managing climate risks and the potential reappraisal of asset market valuations if companies are not managing climate risks with sufficient strength.

For instance, an increasing number of companies are implementing internal carbon pricing and emission reduction targets into their business strategies. CDP found that 85% of companies have an emission reduction target but only 14% of companies have a 2030+ target. By December 2016, more than 200 major companies have a ‘science-based’ target (based on making a fair contribution to the emission reduction ambition of the Paris Agreement).

A report supported by a group of investors aimed to estimate the potential impact in 5 years’ time from a shift in investor’s sentiment regarding the recognition of future climate risks. **Across a range of typical pension fund and insurance company asset allocations, a shift in market sentiment could lead to economic shocks, causing losses in the short and long-term (CISL 2015 - more detail on this study is provided in Section 2 of this article).**

The transition risks to the fossil fuel industry have been highlighted by work conducted by Carbon Tracker. Their findings (which draw on IPCC reports) explained to the investment and business community that the world has a defined carbon budget if the rise in global temperatures is to be limited to no more than 2°C above pre-industrial levels. Carbon Tracker (2014) reported that 99% of fossil fuel companies recognise climate risks, but, only 7% adequately integrate this risk into their project and capital expenditure assessments.

The FSB Task Force has included analysis of the implications of the carbon budget for company and financial sector disclosure. The IEA and Carbon Tracker analysis suggests that the carbon budget would only allow the burning of between one fifth and one third of the world’s proven oil, gas and coal reserves. As a result, the remaining share of fossil fuel reserves would need to be classified as unrecoverable and hence stranded.

A re-pricing of fossil fuel assets if classified as stranded poses risks to investment returns. Consequently many investors are attempting to assess the sensitivity of their investment portfolios to such risks. However, in a twenty page shareholder letter, Shell (May 2014) argued that it “does not believe that any of its proven reserves will become ‘stranded’ as a result of current or reasonably foreseeable future legislation concerning carbon”.

In 2016 in response to shareholder requests, Shell published its 2°C scenario. Their view on the most important near-term change is to shift away from coal power, and that there is increased public and private investment in carbon capture technologies. Some countries could also set carbon taxes on imports or exports (border carbon taxes). Shell states that the transition will incur a range of increased costs for some industries, displacement of investment and jobs from some areas, diminished returns as some investments, particularly unabated hydrocarbon infrastructure, become redundant.

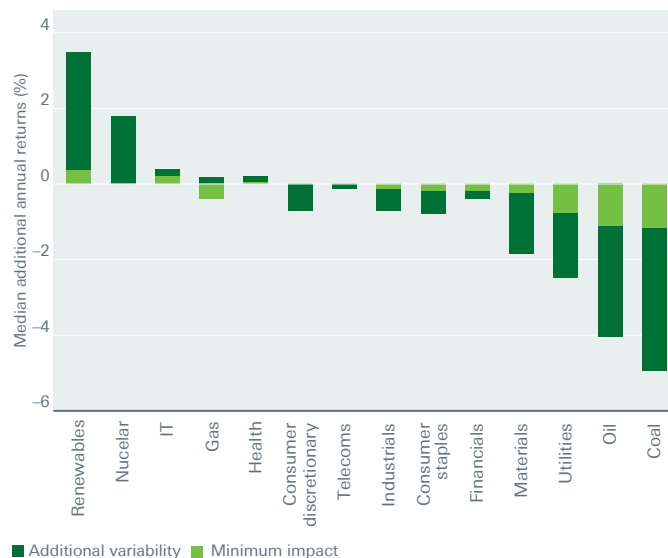
Shell stated “we believe our portfolio is resilient under a wide range of outlooks...we have new immediate plans to move to a net-zero emissions portfolio over our investment horizon of 10-20 years. Net zero emissions...must be driven by society, governments and industry through an effective overall policy framework...we believe the Paris Agreement is a start towards creating such a framework and we look forward to playing a role as society embarks on this very important journey.”

However, Carbon Tracker (May 2016) published a report arguing that the oil majors could be worth USD 140 bn more by reducing their investment in high cost, high carbon oil projects by aligning their investment plans with a 2°C scenario.

These reports confirm the importance of careful analyses of transition risks (Section 2), using this analysis in company engagement activities and engagement with policy-makers (Section 5).

A study conducted by Mercer in 2015 examined the risk to investment returns from various climate change scenarios by sector and from a portfolio asset allocation perspective. One of the key findings, outlined in Figure 5, estimated the likely sector winners and losers from a returns perspective out to 2050. Not surprisingly, the fossil fuel and utilities sectors are most at risk from both a regulatory and technological perspective. Meanwhile the renewables sector has the greatest positive sensitivity due to climate change policies creating new business opportunities.

Figure 5: Climate impact on returns by industry to 2050

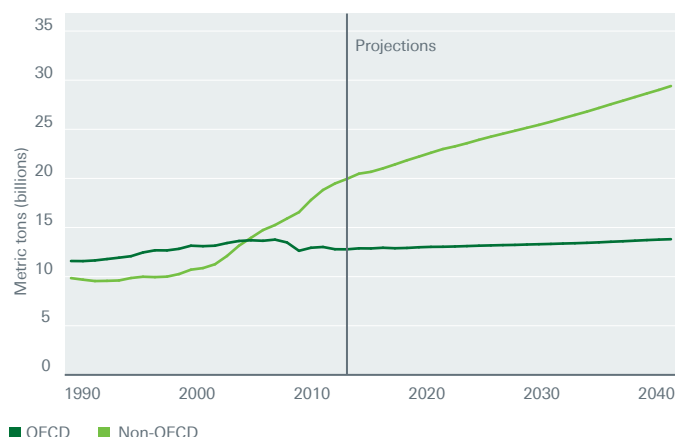


Source: Mercer, June 2015

GHG sources & trends

A useful step in assessing transition related risks, is to understand the sources and trends of greenhouse gas emissions. In 2005, greenhouse gas emissions (GHG) by region were evenly split between OECD and non-OECD countries. However, as rising incomes trigger a surge in energy demand across non-OECD countries, as non-OECD countries have increased their exports of manufactured products and as OECD countries switch to lower emission fuel sources and improve their energy efficiency, non-OECD countries will represent a growing share of global GHG emissions. Indeed estimates by the U.S. Energy Information Administration (May 2016—which reflect the impact of current but not planned/potential government policies) estimate that by 2040 non-OECD countries could account for 68% of energy related carbon emissions, Figure 6.

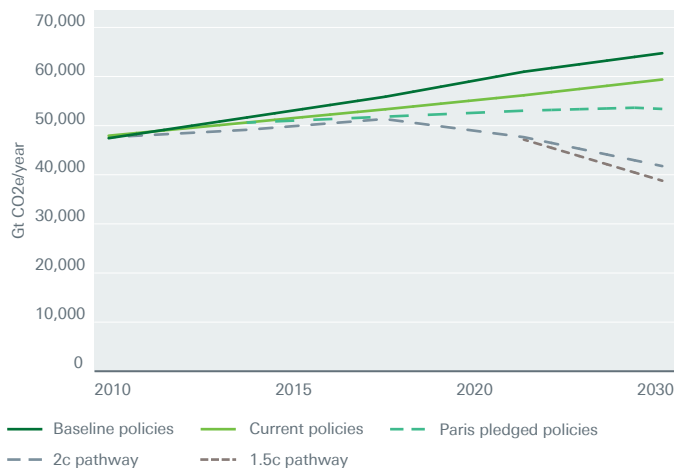
Figure 6: OECD and non-OECD energy related carbon dioxide emissions, 1990-2040 (metric tons in billions)



Source: U.S. DOE/EIA, International Energy Outlook 2016 (May 2016)

The Paris Climate Agreement in December 2015 included almost every single country submitting emission reduction pledges (known as Nationally Determined Contributions NDC). The latest estimates show that if implemented, these policies would reduce emissions. However, as shown in **Figure 7**, there remains a significant gap to the reductions required to meet the Paris Agreement’s goals.

Figure 7: Latest UN Environment emission forecasts

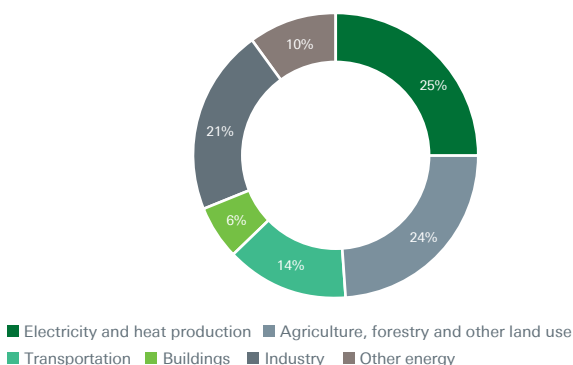


Source: UNEP (2016). The Emissions Gap Report

PwC (2016) estimates that the average annual reduction in carbon intensity must fall by 6.5% (emissions compared to economic growth). In 2015 global carbon intensity fell 2.8% (GDP growth of 3.1% but emissions only increased by 0.2%) which is above the 1.3% average decarbonisation from 2000-2014. This indicates that stronger policies are needed to increase the rate of decarbonisation.

Figure 8 provides a clue to the likely sensitivities of various sectors of the economy to legislation that is set to curb greenhouse gas emissions still further.

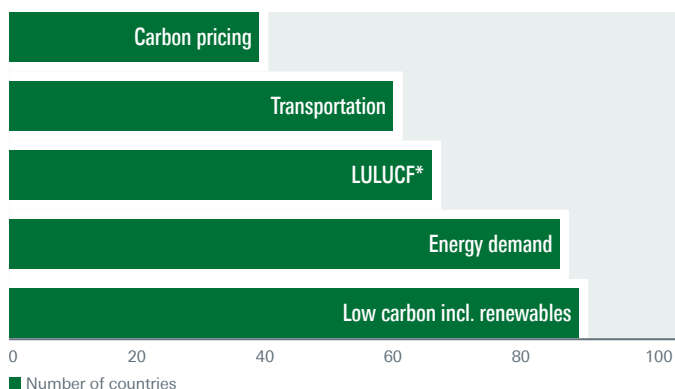
Figure 8: Global GHG emissions by economic sector



Source: IPCC (2014) Fifth Assessment Report

Indeed according to the 2015 Global Climate Legislation Study the number of climate laws passed globally has doubled every five years since 1997, and that this legislation is affecting wide areas of the global economy. Not surprisingly, legislation is typically focused on the energy sector and specifically policies that curb energy demand or push through carbon pricing policies as well as promote low carbon energy sources such as renewables, as shown in **Figure 9**. Greater transparency is therefore needed regarding how a company’s global operations may be subject to different jurisdictions climate policies which may be changing at different speeds.

Figure 9: Number of countries that have carbon emission laws and policies by sector and theme



* Land use, land-use change and forestry
Source: Grantham Research Institute, London School of Economics: The 2015 Global Climate Legislation Study

Forty countries and more than 20 cities, states and provinces have carbon pricing policies. These policies currently cover 13% of global carbon emissions but more than 100 governments (representing 58% of global emissions) aim to use carbon pricing in some way as part of their contribution to the Paris Agreement. In April 2016, a group of political leaders challenged the world to expand carbon pricing to cover 25% of global emissions by 2020 and 50% within the next decade. The group included the heads of state of Canada, Chile, Ethiopia, France, Germany, Mexico, the Governor of California, the Mayor of Rio de Janeiro, the World Bank, the International Monetary Fund and the Organisation for Economic Cooperation and Development (OECD). Assessing the impact of such potential policies will become increasingly important for companies and investors.

Thus, it is encouraging to see that over 1,200 companies currently use or plan to use an internal carbon price over the next two years (World Bank Oct 2016). Companies are using an internal carbon price to guide and test business and investment plans, including as part of financial tests of an investment decision. The use of internal carbon pricing is a good signal of companies having a relatively advanced internal climate risk management as they are anticipating eventual government policies. Investors can encourage more companies to use internal carbon pricing through engagement, as discussed in Section 6.

2 | Measuring and managing climate risks

To date, the approach taken by a number of investors to assess climate risks has been to start by identifying the most carbon intensive companies in their portfolio. In this section we discuss how carbon footprinting should only be a starting point. It is also important to incorporate climate risks into investment beliefs and processes.

The University of Cambridge, in cooperation with a group of asset owners and managers, published one of the first assessments of short-term climate risks—whether the market starts to price in climate risks. This study estimates the potential financial impacts of a shift in investor and consumer beliefs' market sentiment about climate change impacts. **Figure 10** shows modeling results for the impact of three market sentiment scenarios on four portfolios with different asset allocations. See CISL Nov. 2015 for full assumptions. The report adds weight to the conclusion that climate risks are not just long-term. **Short term losses could be 23–40% in a world without strong climate policies and 10–11% in a climate policy action scenario.**

Figure 10: Portfolio performance measured by 5% Value at Risk by type of portfolio and climate scenario

Short term impact (<5 years)

Portfolio structure	Baseline scenario	2 Degree scenario	No mitigation scenario
High Fixed Income	0	-10%	-23%
Conservative	1%	-11%	-36%
Balanced	1%	-11%	-40%
Aggressive	1%	-11%	-45%

Long-term impacts (>5 years)

Portfolio structure	Baseline scenario	2 Degree scenario	No mitigation scenario
High Fixed Income	4%	-3%	-4%
Conservative	12%	9%	-26%
Balanced	16%	17%	-30%
Aggressive	21%	25%	-45%

Source: CISL, Nov. 2015

There is no assurance that any assumptions or forecasts will come to pass. Past performance may not be indicative of future results. The example shown is for illustrative purposes and does not represent any particular investment.

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Investment beliefs and Strategic Asset Allocation

Truly managing climate risks requires an in-depth approach.

In April 2015, the Global Investor Coalition on Climate Change (Apr 2015) published a guide for asset owners to use in developing a policy. The guide suggests steps and provides examples to undertake a strategic review to spread understanding of climate risks and opportunities, engage with asset owner members (if relevant), define investment beliefs regarding climate risk, consider investment constraints, develop a policy and set targets.

Strategic asset allocation (SAA) also needs to be reviewed regarding climate risks. This can include reviewing assumptions, measuring exposure to risks and low-carbon opportunities, seeking to reduce risk and improve opportunity exposure within the existing SAA and setting targets to evolve the SAA.

To help guide the creation of climate related investment beliefs, we believe that investors should think about and be prepared for three broad types of scenarios:

- Steady, if slow progress towards the 2°C target
- Slow climate policy action, followed by rapid catch-up measures, leading to higher transition risks
- Too little—too late, leading to higher physical risks

The FSB Task Force (see Box II) recommendations included a technical supplement on the use of climate scenarios. While the Task Force recommended that work was needed to further improve the availability of scenarios, the Task Force's summary of scenarios is a good overview. Investor and business useable climate scenarios will become increasingly important.

It is notable that Moody's (June 2016) announced that they will analyse the credit implications of the Paris Agreement and transition risk. Moody's identified 13 industries most exposed to transition risk. Coal, coal infrastructure and unregulated power utilities are already being affected and other sectors will be affected in the next three to five years.

While there are many levels of uncertainty in how climate risks will impact investors, this does not justify delays in efforts to develop climate risk management policies and practices. We view the Global Investor Coalition guide as a good starting point.

Carbon foot-printing

Carbon foot-printing is a starting point to provide a very initial assessment as to the relative vulnerability of specific sectors to carbon regulations, such as carbon taxes and emission standards, particularly when compared to an equity benchmark index. If measured accurately, carbon foot-printing can

at least help investors identify the potential scale and concentration of transition risks.

KeplerCheuvreux (2015) in cooperation with the IIGCC, the 2Degrees Investing Initiative and Deloitte published a user guide designed to help connect carbon footprint analysis with investment objectives such as minimising risk and meeting climate targets. The ‘Carbon Compass’ reviews all available carbon foot-printing methodologies.

Within Deutsche Asset Management, our ESG Engine combines all major data providers’ climate and other sustainability data which can be used to estimate a portfolio’s carbon footprint. For more details please see the article on this topic in our first Sustainable Finance Report published last year.

However, one of the challenges is the reliability of emissions data. According to FTSE Russell (2016), 60% of companies in the FTSE All World Index disclose at least a portion of their emissions, but there are significant regional differences in how companies report their direct (Scope 1) carbon emissions, emissions from external energy providers (Scope 2) and

an even smaller proportion report emissions associated with their suppliers and customers (Scope 3). As a result, many companies’ emissions are estimated by different data providers using different methods. Carbon emissions are also a backward looking measure and are only a rough proxy for physical, legal, transition climate related risks and has almost no correlation with companies developing green business opportunities (2 Degrees Investing Nov 2015).

In the U.S., the California Public Employees Retirement System (CalPERS 2015, p.13) scrutinised its entire global equity portfolio. Despite the issues with carbon foot-printing, one of the most interesting findings of their work was the significant degree of carbon emissions’ concentration within its portfolio, such that of the 10,000 companies in CalPERS’s portfolio, just 80 are responsible for 50% of their portfolio’s emissions.

Figure 11, shows different carbon disclosure options currently in the market for investors to potentially use. Clearly this does not cover physical risk and still needs improvement regarding the coverage of transition risk. Figure 11 supports the FSB Task Force’s aim to improve disclosure.

Figure 11: Comparison portfolio of carbon disclosure options

	Metric	Available	Asset class	Pro	Con
Climate goal alignment	Forecast capital plans	✓	Listed Equity Corp bonds	Actual data Open source	Only a few sectors
	Voluntary corporate targets			More sectors than capital plans	Only companies with targets
	Extrapolate past trends				Past trends are a poor proxy
Transition risk	Top down analysis	✓	Cross-asset	Comprehensive	Black box method from 1-2 providers
	Sector level analysis	✓		Simple Can be done in-house	Doesn’t capture intra-sector trends
	Security level analysis	Knowledgeable analysts	Listed Equity Corp bonds	More granular, maybe more accurate	Bespoke
Proxy climate metrics	Carbon footprint	✓	All sectors and asset classes		Does not cover all climate risks, needs some estimates (black-box models)
	Avoided emissions	✓	Listed equity Project finance	Can measure using GHGs	
	Green or brown share of power generation, vehicles etc	✓	Listed Equity Corp bonds	Cross sector average	Only some sectors

Source: 2 Degrees Investing, 2015. The example shown is for illustrative purposes and does not represent any particular investment.

80% of European companies disclose their carbon emissions compared to 60% of North American firms and 50% in Asia. In 2015-16, disclosure rates improved 11% in Asia but only 2% in North America.



The lack of reliable and publicly available data helps to explain the decision by the Financial Stability Board to establish the Task Force on Climate-related Financial Disclosure in November 2015.

The recommendations from the Task Force (see Box II) have been published and are in public consultation until February 2017. Later in 2017, the G20 will advise on how market players and governments should implement the recommendations. Initially this will be voluntary but **we expect climate risk disclosure will become mandatory for companies and the financial sector over time.** Naturally, enhanced climate disclosure and reporting would help in terms of managing climate risks.

Since carbon emissions and intensity in a portfolio are highly concentrated, then steps to monitor, engage and possibly reduce that carbon risk can also be focused on a relatively small number of constituents. However, given the limitations of carbon intensity as a proxy for climate risks, we view the work of the Task Force for Climate-related Financial Disclosure as critical to enhancing the measurement of carbon risk.

We would also expect improved reporting and disclosure will assist in the objectives of the Montreal Carbon Pledge. This commits signatories to measure and publicly disclose the carbon footprint of their investment portfolios on an annual basis. Since its launch in September 2014, there are now over 120 signatories to the Montreal Carbon Pledge with over USD 10 tn assets under management.

Box II—Recommendations of the Task Force on Climate-related Financial Disclosure (TCFD)

Chaired by Michael Bloomberg, this industry led Task Force was announced at the Paris Climate Summit in December 2015 by Financial Stability Board Chairman and Bank of England Governor Mark Carney at the request of the G20. The Task Force is comprised of banks, corporates, investors, accounting firms and rating agencies. The Task Force has focused on what constitutes effective financial disclosures. Its aims were to develop consistent, comparable, reliable and clear disclosures around the carbon intensity of different assets (TCFD Dec 2016).

The Task Force stated that “many organisations incorrectly perceive the implications of climate change to be long term and, therefore, not necessarily relevant to decisions today”.

The Task Force report was published in December 2016 and will be subject to a two month consultation before being discussed by the G20. The Task Force recommends that climate-related financial disclosures be made in mainstream financial filing and that this should include a review by a company’s chief financial officer and audit committee. The core elements of climate-related financial disclosures are:

- **Governance:** Disclose the organisation’s internal governance of climate related risks and opportunities
- **Strategy:** Disclose the potential impacts on the business, its strategy and financial planning

- **Risk management:** Disclose how the organisation identifies, assesses and manages climate related risks
- **Metrics and targets:** Disclose the metrics and targets used to assess and manage relevant climate-related risks and business opportunities

The Task Force also recommends companies and the financial sector undertake and disclose the impact of climate scenarios such as the potential implications of policies aligned with a 2°C goal. Their report includes supplemental guidance for financial and specific non-financial sectors.

The Task Force concludes that improved climate-related financial disclosures will support more appropriate pricing of risks and capital allocation. Just as improved financial disclosure helped 20th century markets to grow, climate disclosure can transform 21st century markets.

Key areas for further work include:

- Encourage standard setting organisations to align and support adoption
- Further research to understand how climate risks translate into potential financial impacts
- Develop methods for allocating emissions to asset classes other than equities
- Improve data quality, enhance risk measurement methods
- Further develop and make public transition scenario tools and data

To encourage implementation of the recommendations of the FSB Task Force on Climate related Financial Disclosure, the asset managers Aviva and Legal and General have stated that they will vote against the annual accounts of carbon intensive companies if they do not work to improve their disclosure in line with the FSB Task Force recommendations.

We believe that an ongoing process is needed involving a wide group of public and private sector stakeholders to discuss, monitor and continuously improve climate disclosure. This should include policy-makers, regulators, central banks, international organisations, plus the finance sector and key corporate sectors.

If an investor has tried to measure the carbon intensity and/or broader climate risks of a portfolio, next steps can include deciding how to reduce holdings of most at risk assets, whether to consider divestment, how to re-invest in companies with less climate risks and those who are leaders in low-carbon technology solutions (Section 4 of this article) and how to engage with companies to encourage improved climate risk management (Section 5 of this article).

If an investor is reducing portfolio climate risks, then they can consider making a public declaration by signing up to the Portfolio Decarbonisation Coalition (PDC) which commits signatories to reduce the carbon intensity of their investment portfolios. Membership of the PDC has reached 27 asset owners and managers who aim to reduce the carbon intensity of around USD 600 billion of assets. In addition to portfolio decarbonisation a signatory to the PDC also pledges that 5% of their portfolio will be dedicated to climate solutions.

Assessing climate risk materiality

In 2010, the U.S. Securities and Exchange Commission published guidance that when climate-related risks are material, companies must disclose relevant information as part of their 'Regulation S-K' disclosures. However, 40% of disclosures used 'boiler-plate' statements and only 17% use metrics (SASB Oct 2016). This makes it very difficult to compare companies' performance.

In address this problem, the Sustainability Accounting Standards Board (SASB) assessed the materiality of climate risks for companies across the entire U.S. economy. Physical, legal and transition risks were assessed based on if they could lead to financial impacts on revenue, cash flow and operations, asset values or financing. SASB found that 72 of 79 industries (93% of the U.S. equity market) could be affected in some way, indicating that these risks cannot be diversified away. SASB developed a Climate Risk Materiality Map, an extract of which is shown in Figure 12.

The climate risk framework allows investors to identify the way in which climate risk could impact corporate financial value in industry specific ways. SASB's work was an input to the FSB Task Force on Climate related Financial Disclosure. The Task Force identified a number of sectors (energy, transport, materials/building and agriculture/food/forest products) that would benefit from sector-specific guidance.

Figure 12: Extract of Climate Risk Materiality Map

Sector	Physical risk	Legal risk	Transition risk
Pharmaceuticals	✓		✓
Commercial banks			✓
Semiconductors	✓	✓	✓
Iron & Steel	✓	✓	✓
Automobiles		✓	✓
Chemicals	✓	✓	✓
Appliance manufacturing		✓	
Real estate	✓	✓	✓

Sources: SASB Oct 2016

SASB is also currently consulting (until Q2 2017) on provisional sustainability accounting standards across 79 industries. While this initiative has started in the U.S., SASB's comprehensive approach (and leadership from its Chair Michael Bloomberg and Vice Chair Mary Schapiro, former Chair of the Securities and Exchange Commission) makes it a global best practice. We expect sector experts will engage with SASB to provide feedback on whether they have captured the most material ESG risks and appropriate indicators. We believe SASB recommendations are therefore a key input for different disclosure initiatives.

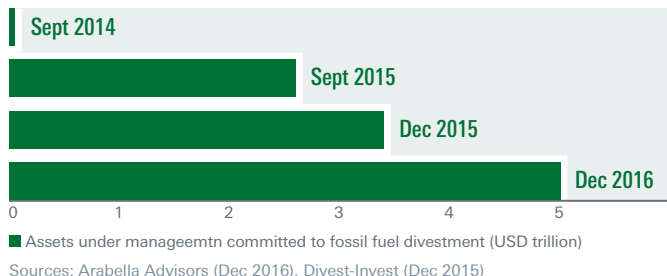
3 | Divesting of climate risks

Divestment typically refers to the withdrawing or withholding of financial capital from a specific industry (tobacco), sector (energy) or country (Sudan). The factors most often cited to justify divestment out of fossil fuels include:

- (i) Fossil fuel holdings are unacceptable as investors are benefiting from an industry that is accelerating the hazardous effects of climate change
- (ii) Divestment out of fossil fuels is believed to be a prudent investment decision from a fiduciary perspective as it ensures investment portfolios do not succumb to stranded asset risk
- (iii) Divestment allows investment portfolios to focus on companies and sectors with green revenues streams, which help reduce greenhouse gas emissions and promote the transition to a low carbon economy
- (iv) Divestment aims to promote climate friendly legislation, such as the removal of fossil fuel subsidies and/or the introduction of carbon taxes in an effort to curb fossil fuel consumption

Starting with U.S. universities and colleges, the past few years has seen significant growth in the total assets of institutions that are committed to divest, Figure 13, though this does not measure the assets that have actually been divested.

Figure 13: Tracking fossil fuel divestment



So far, 79% of those divesting are from local government, philanthropic, faith-based, health and educational institutions, plus commitments from nearly sixty thousand individuals including some notable high net-worth investors.

Notable private sector investors who have announced partial or full divestment include the insurance/asset management companies Aegon, Allianz, Aviva, Axa, the AP4 pension fund, Norges Investment Management and the Dutch pension fund PFZW.

Naturally many divestment programmes lead to replacement investment strategies. The typical beneficiaries of the fossil fuel divestment switch are renewable energy, energy efficiency, sustainable agriculture and other low carbon investment solutions.

However, for other investors, full divestment out of the fossil fuel sector is not considered a viable investment strategy. In many instances the removal of certain stocks not only leads

to a reduction in risk adjusted returns, but, it can also lead to less efficient portfolio diversification. Therefore, investor strategies should also be able to select and prioritise companies that are best prepared and positioned to manage and profit from the low-carbon transition.

Critics of the fossil fuel divestment campaign also cite the fact that 70% of fossil fuel reserves are held by sovereign states, most notably in the Middle East and consequently stranded asset risk is more heavily skewed to these entities.

These factors may therefore have contributed to divestment programmes that are less aggressive in scope. Rather than the complete elimination of all fossil fuel companies, divestment can be confined to companies developing high-cost, high-carbon reserves, such as in the coal and oil sands sectors or to companies who are not managing climate risk sufficiently strongly.

Since some investors question what divestment in publicly listed fossil fuel companies will achieve, engagement rather than outright divestment can be viewed as a more constructive approach.

In certain countries, divestment is moving center stage as a result of regulation. In 2015, California’s state legislature passed a coal divestment bill that required CalPERS and CalSTRS to divest out of their holdings in companies that earn at least half of their revenues from coal mining. New York, Massachusetts and other U.S. states are examining similar divestment bills. Public pension funds are therefore joining alongside institutional and individual investors in the fossil fuel divestment campaign.

Oxford University researchers examining fossil fuel and other divestment campaigns concluded that direct impacts are likely to be limited: share prices are unlikely to suffer precipitous declines and holdings will likely be taken up by neutral investors. **If divestment is to have any impact on company valuation, changes are needed in market norms and by constraining debt markets** (Smith School, Oct 2013).

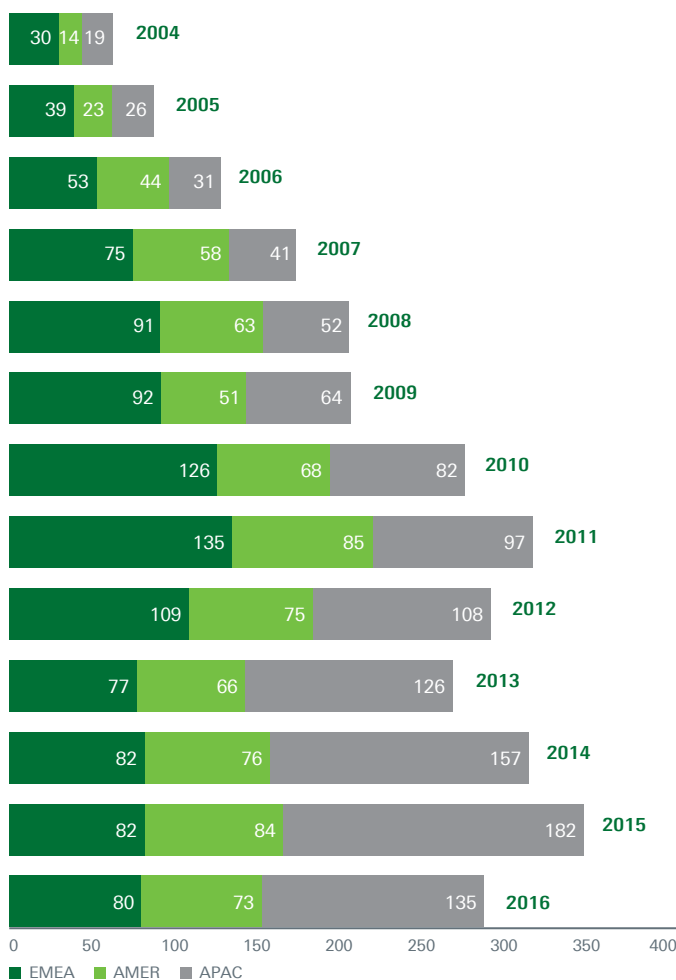
We believe that investor support for implementation of the FSB Task Force recommendations and for stronger climate policies are likely to be the best ways to lead to changes in market norms, the pricing of carbon intensive companies share and bond prices and a reduction in climate risks. However, the divestment movement has and will continue to play a key role in this overall process, even if fewer investors divest than what advocates may hope.

4 | Investing in solutions

While divestment removes any exposure to fossil fuels and investor engagement seeks medium-term risk reduction and improved returns, exploiting opportunities in green revenue streams is also important.

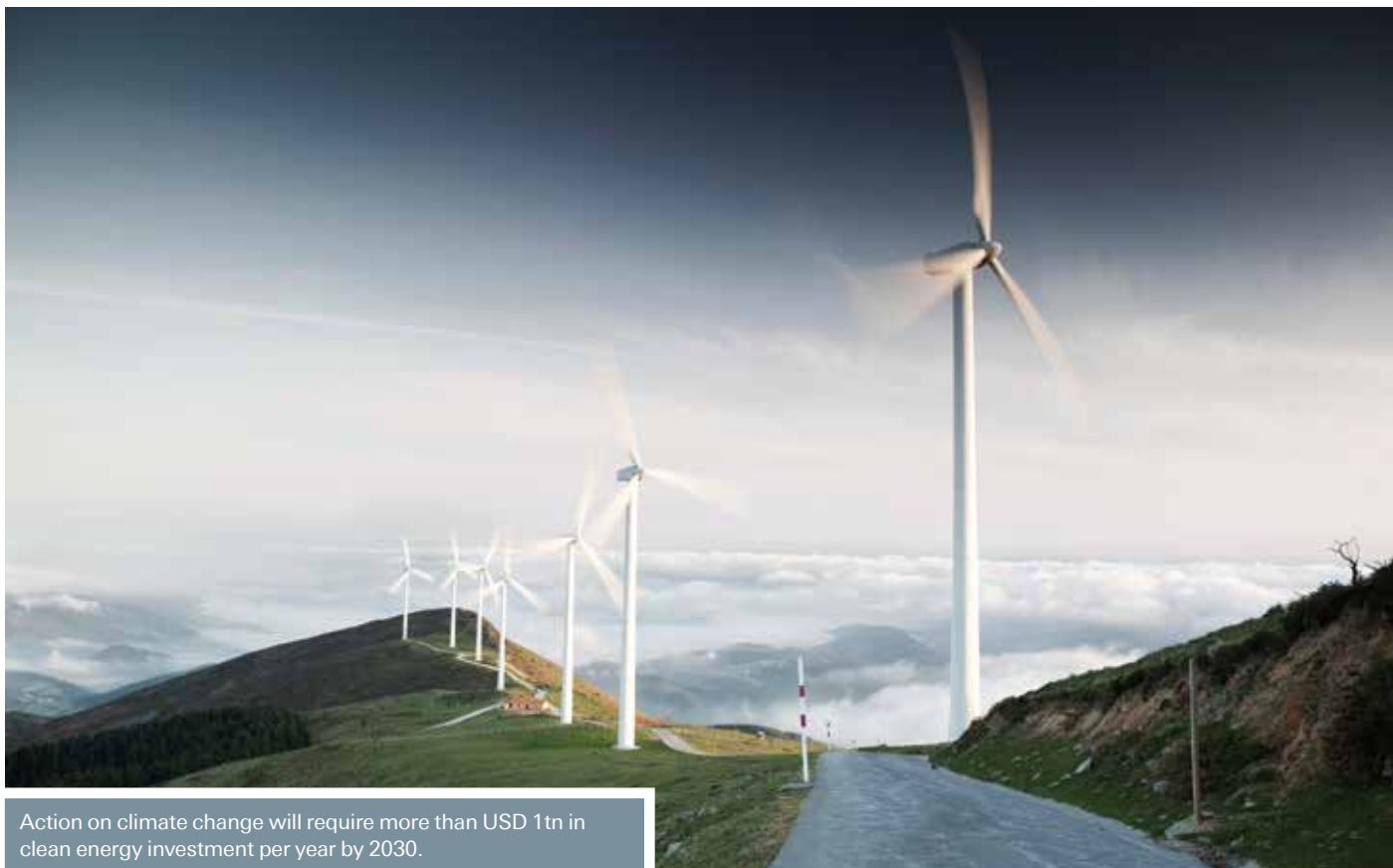
According to IEA estimates, to have an 80% chance of limiting the rise in global temperatures to no more than 2°C above pre-industrial levels will require clean energy investment reaching USD 500 bn per annum by 2020 and investment of more than USD 1 tn per annum by 2030. Clean energy investment hit a record high in 2015 of USD 359 bn, before falling to USD 288 bn in 2016, **Figure 14**. Half of the investment reduction is due to falling equipment prices meaning that more renewable energy capacity is actually installed. China and Japan did reduce the number of large-scale renewable projects, though offshore wind investment grew 40% last year. China remains the largest renewable energy market (which we discussed in the first edition of our Sustainable Finance Report), followed by the U.S. (which we discuss in article #4 in this report).

Figure 14: Total annual clean energy investment



Source: Bloomberg New Energy Finance (2016)

Examples of asset owner low carbon commitments include the Dutch health care pension fund PFZW and the Swedish National Pension Fund AP4. For PFZW, it has committed to halve its portfolio carbon footprint by 2020. This will involve divesting completely from coal-related companies by 2020 and reducing investment in fossil fuel companies by 30%. In addition and as part of its investment replacement strategy, PFZW will quadruple its investments in sustainability



Action on climate change will require more than USD 1tn in clean energy investment per year by 2030.

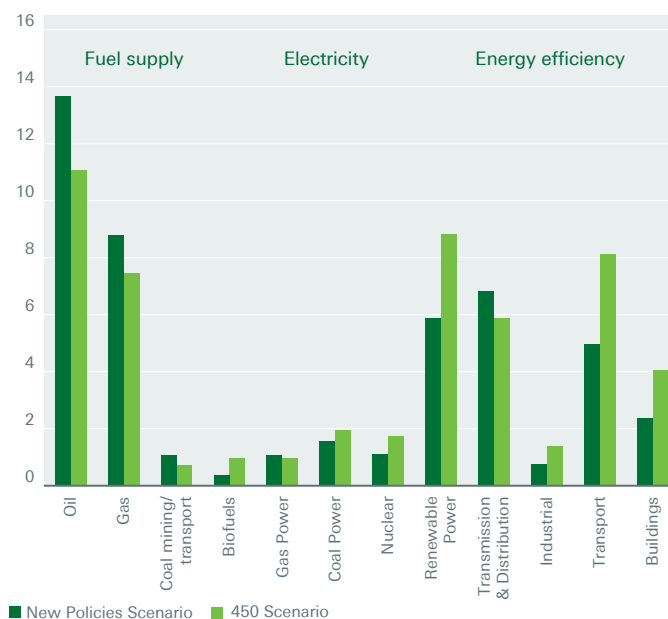
investment such that it will eventually represent 12% of assets over the same time frame. This follows comparable clean energy commitments by other asset owners such as APG of the Netherlands, Aviva in the UK and Axa in France.

In terms of technology, over the past few years solar and wind have consistently captured over 70% of all renewables investment. However, significantly larger investment inflows into the clean energy sector are required to meet climate goals. We expect investment opportunities will be particularly focused towards renewable energy, clean transportation and energy efficiency. Figure 15 shows the IEA's forecast for how energy investment may change comparing their 2014 New Policies Scenario (which refers to the impact of current and announced but not implemented policies) and the 450 scenario (which refers to the atmospheric concentration of carbon emissions generally associated with a 2°C future).

Fossil fuel related investment represents 54% of total energy sector investment in the New Policy Scenario but falls to 42% in the 450 scenario.

While coal power investment is 25% higher in the IEA's 450 scenario, the total power generation capacity that could be added is similar. The higher investment is due to the higher cost of more efficient coal power technologies and carbon capture and storage (i.e. capturing carbon emissions from power plants or factories and injecting emissions to be stored long-term in geological formations).

Figure 15: Cumulative investment in energy supply and energy efficiency by scenario, 2014-2035 (USD tn)



Source: IEA (2014)

Almost every asset class in the public and private markets has the opportunity and the necessity to contribute the capital necessary for low carbon technology solutions. **Figure 16** displays current and future options for climate related investment in different asset classes.

While climate change is relevant to all asset classes, the Principles for Responsible Investment's (PRI) 2015 industry assessment found that climate change is only mentioned by

10% of signatories as an issue affecting investment performance/selection for listed equity, 12% for fixed income, 18% for private equity, 27% for real estate and 48% for infrastructure (PRI 2015). We expect that the 2016 assessment will show higher results, particularly due to the Paris Climate Agreement becoming international law, the FSB Task Force (see Box 1 and 2), and more asset owner requests/requirements.

Figure 16: Asset class climate related investment options

Asset class	Opportunities
Equities	<p>Create low climate risk benchmarks for passive funds and to evaluate active funds</p> <p>Ensure climate is a core part of ESG integration efforts in all active funds</p> <p>Thematic funds: 3% of listed equities have exposure to low carbon technologies but the supply chains for these companies may include 27% of the market (Goldman Sachs Nov 2016)</p> <p>FTSE Russell (June 2016) estimates that 2,400 of 13,400 public companies have green technology revenue equal to USD 2.9 tn, nearly the same size as the market capitalisation of emerging markets companies</p>
Bonds	<p>Climate aligned bonds from corporates and supranational agencies grew from USD 174 bn in 2012 to USD 694 bn in 2015 (labelled green bonds are a subset: USD 77 bn in 2016) CBI (2016)</p> <p>Standard and Poor's concluded that climate change is a global mega-trend for sovereign bonds risk (S&P Nov 2015)</p> <p>Integrate climate risk assessment in all actively managed fixed income funds: starting in 2013, S&P (Oct 2015) found 299 cases where environmental and climate risks resulted in or contributed to a rating revision. In 56 cases, this had a direct and material impact –80% of rating changes were negative</p> <p>Create low climate risk benchmarks for passive corporate bond funds</p> <p>Mortgage backed securities (MBS): Banks and regulators could require the incorporation of energy cost, energy efficiency and green building value into mortgage underwriting and portfolio stress tests to create the potential for green mortgage bonds</p> <p>Policy and market innovation should expand on the USD 1.5 bn+ of asset backed building retrofit green bonds issued (Renovate America Nov 2016)</p>
Infrastructure	<p>Target low-carbon technologies within general infrastructure funds</p> <p>Target urban infrastructure technologies to support smart/compact city growth</p> <p>Consider using the Standard for Sustainable and Resilient Infrastructure (SuRe) to measure and monitor assets' resilience to climate risks (GIB, July 2016)</p>
Real estate	<p>Improve the energy efficiency of buildings (see article #6 in this report)</p> <p>Improve physical climate risk analysis of real estate</p>
Private equity	<p>Opportunities to support the expansion of new technologies, such as in the U.S. or in China</p> <p>Investors can use the private equity climate guide to ask general partners about their climate risk and opportunity identification, regulatory assessment, management and reporting (IIGCC 2016)</p> <p>General partners can use the guide to ask their current and potential investees similar questions</p>
Private debt	<p>Particularly for some emerging markets and/or new sectors/technologies, using public capital to reduce private investor risk is an important way to deploy capital where needed and create new sources of yield for investors that also contribute to sustainability and climate goals</p>

Source: Deutsche AM analysis 2016, Climate Bonds 2016, FTSE Russell June 2016, GIB 2016, IIGCC 2016, S&P May 2014
The example shown is for illustrative purposes and does not represent any particular investment.

5 | Engaging investees and governments

Another route to affect change within companies is through engagement, which is defined as investors seeking to bring about change in ESG issues through dialogue with companies and markets.

Engagement primarily includes written correspondence and investor-company meetings but can escalate to statements to the press and at annual general meetings, shareholder resolutions, voting against approval of a company’s annual accounts and even divestment. Investor engagement can cover a wide range of topics from business strategy, performance, risk, capital structure and ESG issues including climate change.

In September 2013, 75 investors with USD 3.5 tn in assets launched the Carbon Asset Risk initiative to ask 45 of the largest fossil fuel companies to disclose the magnitude and improve their management of carbon risks. Since then, the management of six major European oil companies supported shareholder resolutions for the companies to undertake climate stress tests (leading to votes of 98%+ in favour) and wrote a joint letter to the UN calling for a global price on carbon (Ceres 2015). Similar shareholder resolutions received 38% at ExxonMobil and 41% at Chevron (Ceres May 2016).

While more major investors are likely to support similar resolutions in 2017, the appointment of ExxonMobil’s CEO as U.S. Secretary of State and the new U.S. government’s approach to climate and energy policies will likely affect whether major U.S. investors also support these resolutions. U.S. investors who supported the resolutions at European oil companies have been criticised for not supporting nearly identical resolutions in the U.S., just because management did not support the resolution.

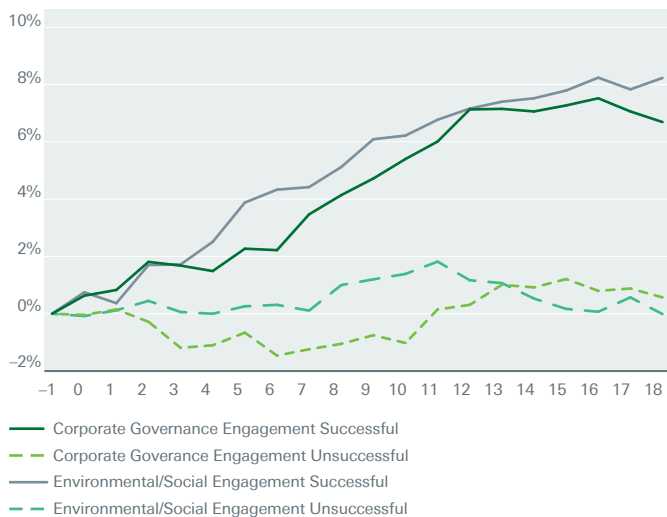
Investor groups have published a series of ‘Investor Expectations’ for sectors including oil and gas, electric utilities, automotive and the mining industry. These reports provide a guide for investors to have a constructive engagement with company boards to encourage stronger sustainable business strategies. The guides address company governance, operational efficiency, strategy implementation, preparation for physical climate risks, public policy, transparency and disclosure.

Research (Dimson, Karakaş and Li, Aug 2015, p.3–4) has found that engagement can have positive financial benefits. Figure 17, show a positive return for companies which made changes following an investor engagement with them on environmental and corporate governance issues. The academics studied 613 U.S. companies engaged by a U.S. asset manager between 1999 and 2009. While it took 2–3

engagements of 1–1.5 years each for a ‘success’, the time and effort appears to be worthwhile. The companies engaged were large, mature and before engagement had poor performance both financially and reputationally.

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

Figure 17: Investment returns from engagement



Source: Dimson, Karakaş and Li, Aug 2015

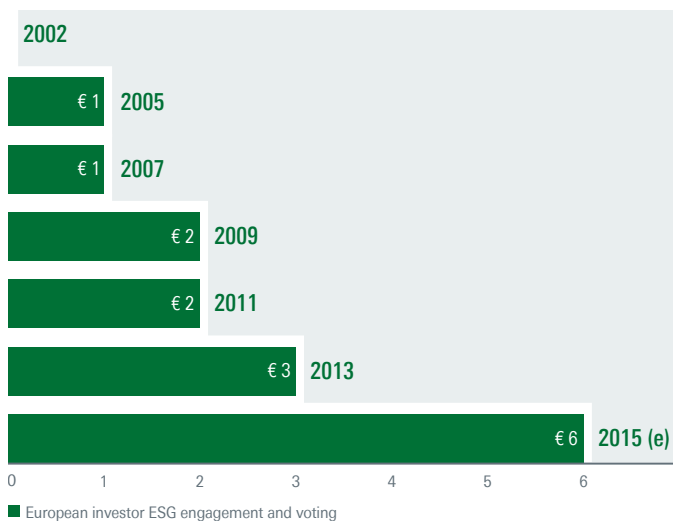
Following a successful engagement, the firms’ performance improved, it attracted a wider investor base and had lower stock volatility. For environmental/social engagements, the return on assets and ratio of sales to employees improved significantly, indicating that engagement can improve customer and employee loyalty. Dimson, Karakaş and Li (Aug 2015) conclude that “Active ownership attenuates managerial myopia and hence helps to minimize inter-temporal losses of profits and negative externalities”.

This finding corresponds with CDP which found that companies in the S&P500 that are actively managing climate risks had an 18% higher return on investment and 67% higher return than companies who did not disclose their emissions.

Companies with stronger climate risk management had 50% lower volatility over the previous ten years and grew dividends 21% more than low scoring peers (CDP 2014).

On other ESG issues, growing numbers of investors are undertaking engagement activities, **Figure 18**. In addition, a number of industry stewardship codes have been created (see article #1 in this report) to encourage engagement. The PRI (2015) also found that asset owners are increasingly engaging directly as well as via their asset managers.

Figure 18: European ESG engagement



Source: Sustainalytics and Cass Business School June 2016

Despite the growth of investor engagement and the positive benefits that engagement can create, the quantity and quality of investor engagement with companies is likely lower than ideal. As well, PRI (2015) found that climate was only mentioned as a focus for 17% of signatories' ESG engagement activities last year. We expect that this figure will be higher for 2016, but this is only within those investors who do undertake broad engagement activities.

The Kay Review of UK Equity Markets and Long-Term Decision-Making (2012) concluded that stewardship or engagement is a core function of equity markets. Kay stated that the focus should be quality not number of engagements. However, the fragmentation of equity markets has reduced the incentives for engagement. Asset manager competition of trying to outperform based on anticipating changes in market prices and keeping fees low, reduces the incentive to undertake engagement. Engagement activities that improve company performance benefits the entire market, which creates under-investment in engagement.

The UK Law Commission (2014), which advises the UK parliament on question of law, concluded that there was not a duty on pension trustees or other investors to undertake stewardship activities (though the UK Pensions and Lifetime Savings Association had suggested that it should be). Asset managers should 'comply or explain' their approach to the Stewardship Code. Requiring engagement would require a change in law.

Assumptions estimates and opinions contained in this document constitute our judgment as of the date of this document and are subject to change without notice. There is no assurance that any assumptions or forecasts will come to pass.

The EU Shareholder Rights Directive became law in late 2016 and member states will have to implement its provisions in national law. Amongst its aims are to increase the level and quality of engagement of asset owners and managers with their investee companies. Essentially the Directive requires investors and asset managers to disclose (or explain why they do not) information on their engagement policy, how engagement is carried out and integrated in their investment strategy, how potential conflicts of interest are handled and the exercising of proxy voting rights (EC 2016).

As countries look to implement this Directive as well as the FSB Task Force recommendations and climate policies more broadly, best practice sharing between investors, regulators and companies is needed.

The PRI's annual evaluation of signatories does include a section on engagement and proxy voting. Signatories are evaluated by the PRI on the objectives of their engagement activities, the number and intensity of companies engaged by the investor and collectively with other investors, the percentage of votes cast and whether companies were informed of the rationale for abstaining/voting against management.

We also expect asset owners to put more weight on engagement when deciding to award investment mandates. Given the positive benefits of engagement, incorporating engagement requirements in investment mandates would be in asset owners' own interests. However, balancing how this is paid for may need discussion between asset owners and managers, particularly for passive strategies.

Mercer (Feb 2015) established an ESG rating for passively managed funds but did not award a top score in their evaluation of five of the world's largest passive fund managers. Mercer evaluated how well passive fund managers undertook proxy voting, engagement, industry collaboration and ESG reporting.

A Mercer researcher stated "*Passive investors have a clear financial interest in the long-term welfare of companies they invest in, but they are unable to take direct action through buying and selling stocks as active managers do. As they can't walk away from companies that underperform, engagement with companies should be a core function for investment firms that manage passive strategies*". ESG and climate focused benchmarks can be created that would exclude companies or allow companies to rejoin an index if they improved their ESG and climate related policies and practices.

While passively managed strategies have grown rapidly, ESG engagement is not a common practice. We expect this will change as leading asset owners look to secure the benefits of engagement and as asset managers aim to differentiate their offering.

Policy engagement

Investors played an important role in encouraging governments to reach and then ratify the Paris Climate Agreement.

A survey of PRI (2015) signatories found that 76% believed the PRI have a role in influencing policy to support long-term sustainable investment practices. However, of 814 PRI signatories only 332 (41%) indicated that they—individually or in collaboration with others—had conducted dialogue with public policy makers or regulators in 2014. While 63% of PRI asset owner signatories engaged policy makers in 2015 (a slight increase from 2014), only 50% of asset managers engaged policy makers in 2015 (which was a slight decrease from 2014). More PRI signatories in the UK and Australia undertook climate policy engagement in 2015 than in other regions.

The PRI (2014) published a report on the case for institutional investors to undertake public policy engagement, case studies and lessons learned and practical recommendations for investors and policy-makers to better account for ESG factors in public policymaking.

In the forward to the report, Lord Adair Turner (former head of the UK financial regulator and the UK’s official climate change policy advisory committee) stated:

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

One of the Principles for Responsible Investment is that signatories commit to identify and remove “obstacles to a sustainable financial system that lie within market practices, structures and regulation”. Despite this requirement, investors may be sceptical about whether public policy engagement makes a difference, a lack of understanding of how to influence policy processes or be concerned about the costs and time-frames involved.

The PRI report addresses each of these concerns by examining how investors played key roles in creating changes in corporate and investor ESG disclosure in France, the EU’s insurance sector regulations, Japan’s Stewardship Code, South Africa’s Code for Responsible Investing, and U.S. SEC guidance on corporate climate change disclosure.

One of the main ways investors have been active in the area of climate policy is through the four regional groups of the Global Investor Coalition on Climate:

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

- Investor Network on Climate Risk (INCR—North America)
- Investors Group on Climate Change (IGCC—Australia and New Zealand)
- Asia Investors Group on Climate Change (AIGCC)

Collectively these groups have more than 250 investors with assets of over USD 24 tn. While their membership has been growing over the past several years, PRI signatories have USD 59 tn in assets. This indicates that many more investors do not act cooperatively on climate policy by, for instance, meeting with and writing letters to policy makers.

6 | Conclusion

The physical, regulatory and transition risks associated with climate change are capturing increasing attention among policymakers, regulators and investors. We view the work of the FSB’s Task Force on Climate-related Financial Disclosure as critical in delivering enhanced climate risk data. The Task Force’s work, if widely adopted, will enable investors not only to measure more accurately the degree of climate associated risk in their portfolios, but it will also facilitate the debate as to whether and how investors want to address these risks. Indeed the climate risk debate is intensifying as investors consider the various merits of fossil fuel divestment, investor engagement and/or climate investment solutions. Despite certainties, climate change is a material risk that investors can and should begin managing with a variety of tools and approaches.

Indeed we find an increasing number of asset owners adopting low carbon commitments. This involves not only reducing or excluding completely holdings in the fossil fuel sector, but, also raising allocations to green investments such as clean energy and green infrastructure. We expect these activities will continue not least given the relentless march of legislation in this area and the associated portfolio risks this entails.

One of the aims of engagement with fossil fuel companies is to deliver more transparency in their investment decisions. Shareholders can assist management in assessing how certain activities will impact the climate, such as high-cost high-carbon capital expenditures. Consequently more scrutiny can be placed on such carbon intensive projects. Engagement can also be justified on the expectation of extracting superior returns.

Investors are becoming increasingly engaged in policy initiatives and governments are appropriately giving their suggestions more weight due to their long-term ESG and financial perspectives. This trend is likely to be encouraged by forward looking asset owners rewarding asset managers who undertake policy engagement, regulators encouraging or allowing asset owners and managers to engage on policy issues and by investors looking to differentiate themselves, gain advance knowledge of new policies and to improve the market for ESG and low climate risk investment solutions.

References

- 2 Degrees Investing Initiative, Nov 2015. *Carbon intensity does not equal carbon risk exposure*
- 2 Degrees Investing Initiative, Nov 2015
- Arabella Advisors, December 2016. *Divestment*
- Avoid2, 2015. *Avoiding the Impacts of Dangerous Climate Change*
- Bank of England, September 2015
- Bloomberg New Energy Finance, 2016. *Q3 Factsheet*
- Bloomberg 2015
- Carbon Brief, May 2016. *Only five years left before 1.5C carbon budget is blown*
- Carbon Tracker, 2014
- Carbon Tracker, May 2016. *Sense and Sensitivity: Maximising Value with a 2D Portfolio*
- CDP, 2014. *Climate action and profitability*
- CalPERS, November 2015. *Report on Global Equity Portfolio Carbon Footprint*
- ClientEarth, Nov 2016. *QC Opinion: the legal duties of pension fund trustees in relation to climate change*
- Climate Bonds Initiative (CBI), 2016
- Climate Change Committee (CCC), 2016. *UK Adaptation Policy*
- Cambridge Institute for Sustainability Leadership (CISL), Nov 2015. *Unhedgeable risk: How climate change sentiment impacts investment*
- Dimson, Elroy, Oğuzhan Karakaş and Xi Li, Aug 2015. *Active Ownership*
- Divest-Invest, December 2015
- Douglas, Rowan, Nov 2014. *Integrating natural disaster risks and resilience into the financial sector. Willis Towers Watson*
- European Commission (EC), 2016. *Proposal for a Directive of the European Parliament and of the Council amending Directive 2007/36/EC as regards the encouragement of long-term shareholder engagement and Directive 2013/34/EU as regards certain elements of the corporate governance statement*
- Economist Intelligence Unit and Vivid Economics, 2014. *The cost of inaction*
- Energy Information Administration (EIA), May 2016.
- FTSE Russell, 2016. *FTSE4Good 15 year anniversary report*
- FTSE Russell, June 2016. *New Green Revenues model*
- Global Infrastructure Basel (GIB), July 2016. *The Standard for Sustainable and Resilient Infrastructure*
- Global Investor Coalition on Climate Change, April 2015. *Climate Change Investment Solutions: a Guide for Asset Owners*
- Goldman Sachs, Nov 2016. *The Low Carbon Economy: Technology in the Driver's Seat*
- International Energy Agency (IEA), 2012. *Energy Technology Perspectives*
- International Energy Agency (IEA), 2014. *World Energy Investment Outlook*
- Inter-governmental Panel on Climate Change (IPCC), 2014. *Fifth Assessment Report*
- Institutional Investors Group on Climate Change (IIGCC),
- Kay, John, 2012. *Kay Review of UK Equity Markets and Long-Term Decision-Making,*
- KeplerChevreux, 2015. *Carbon Compass*
- Law Commission, June 2014. *Fiduciary Duties of Investment Intermediaries*
- Mercer, February 2015. *Passive managers can do more to enhance corporate engagement*
- Mercer, June 2015. *Investing in a time of climate change*
- Moody's, June 2016. *Moody's to use greenhouse gas emission reduction scenario consistent with Paris Agreement to analyse carbon transition risk*
- Patton, Lindene, Sept 2016. *Bloomberg BNA Insights #174: Advances in Attribution Science, Emergence of Aggressive Climate Litigation Changing the Landscape for Voluntary Disclosure Programs*
- PRI, 2013. *Collaborative Engagement Introductory Guide*
- PRI, 2014. *Case for investor engagement in public policy*
- PRI, 2015. *Report on Progress*
- Prudential Regulatory Authority (PRA), Sept 2015. *The impact of climate change on the UK insurance sector*
- PwC, 2016. *Low Carbon Economy Index*
- Renovate America, November 2016

Investors are adopting a range of ESG investment styles to address specific sustainability mega-trends such as climate change, resource scarcity and urbanization.



Schleussner, Carl-Friedrich, Tabea K. Lissner, Erich M. Fischer, Jan Wohland, Mahé Perrette, Antonius Golly, Joeri Rogelj, Katelin Childers, Jacob Schewe, Katja Frieler, Matthias Mengel, William Hare, and Michiel Schaeffer, April 2016. *Differential climate impacts for policy-relevant limits to global warming: the case of 1.5°C and 2°C*

Shell, May 2014. *Shell letter in response to shareholder enquires on climate change*

Shell, May 2016. *Better Life with a Healthy Planet: Pathways to net-zero emissions*

Standard and Poor's (S&P), Nov 2015. *The Heat Is On: How Climate Change Can Impact Sovereign Ratings* Standard and Poor's (S&P), Oct 2015. *How Environmental and Climate Risks Factor Into Global Corporate Ratings*

Strauss, B. H., Kulp, S. and Levermann, A. 2015. *Mapping Choices: Carbon, Climate, and Rising Seas, Our Global Legacy*. Climate Central Research Report.

Sustainability Accounting Standards Board (SASB), Oct 2016. *Climate Risk Technical Bulletin*

Sustainalytics and Cass Business School, June 2016. *Engagement: unlocking the black box of value creation*

Task Force on Climate related Financial Disclosure (TCFD), Dec 2016. *Recommendations of the Task Force*

Tanaka, Misa; Sandra Batten and Rhiannon Sowerbutts, Nov 2016. *Let's talk about the weather: the impact of climate change on central banks*. Bank of England

UN Environment Programme (UNEP), 2016. *The Emissions Gap Report*

United Nations Framework Convention on Climate Change (UNFCCC), 2013. *Warsaw international mechanism for loss and damage associated with climate change impacts*

United Nations Framework Convention on Climate Change (UNFCCC), 2015. *Paris Climate Agreement*

Urgenda 2015. *Climate Case Against the Dutch Government*

World Resources Institute (WRI), 2016. *Climate Data Explorer—INDCs*



**THE SEARCH FOR YIELD AND
THE U.S. RENEWABLES
SECTOR**

Investor interest towards real assets and specifically infrastructure is on the rise. Part of this added appeal reflects a more inventive mindset among investors to seek out yield as global interest rates have slumped towards zero. In this article, we examine the significant transformation of the U.S. power sector that has been underway for more than a decade. This transformation has, in part, been triggered by the collapse in natural gas prices as well as the increasing competitiveness of renewable energy compared to more traditional fuels such as coal. We also assess, at this early stage, the possible implications of the new Republican administration and how federal, state and corporate activities in the renewable sector might evolve.

Executive summary

In our first Sustainable Finance Report published last year, we examined the transformation of the Chinese power generation sector and the leading position China was establishing in the renewables sector. Here, we examine prospects for the U.S. renewables sector and the risks and opportunities that are unfolding from a competitive and regulatory perspective.

According to the International Renewable Energy Agency (Irena), the number of jobs in the global renewables sector reached 8.1 million in 2015 with China, Brazil and the United States accounting for almost two thirds of people employed in the renewables sector globally. By 2030, Irena estimates a threefold increase in the number of people employed in the global renewables sector.

In the U.S., of the roughly 770K people employed in the renewable sector, the solar sector accounts for just over a quarter with the wind industry employing approximately 90K. Jobs in the U.S. solar sector have increased by over 60% in the three years to 2015. As a result, more people are employed in the U.S. solar industry today than in the domestic oil and gas extraction sector (187K).

In the U.S., the deployment of renewable technology has been assisted by falling costs across the wind and solar sectors, which has made renewable power generation increasingly competitive compared to more traditional generating sources such as coal and natural gas.

The growth in the renewable sector has also been driven by a desire among utilities and independent power producers to diversify power fleets. According to the EIA, renewables, excluding hydro, accounted for just 7.3% of the U.S. power generation mix in 2015 with obvious room for growth.

The renewable sector is also being boosted by consumer demands for clean energy as well as U.S. corporates such as Walmart, Google and Apple stating their intent to source up to 100% of their energy from renewables.

In addition, 29 U.S. states have Renewable Portfolio Standards which mandate that a certain proportion of electricity generated must come from renewable sources. For example, New York and California have set targets that renewable energy must account for at least half of their energy source by 2030.

We believe renewable projects are also attractive from a yield and cash flow perspective. Renewable energy projects tend to be long-lived assets with 20-25 year financial lives and generally have consistent, long-term contracted cash flows that are independent of fossil based fuel price volatility. Such projects have garnered the attention of those seeking long-term, stable and relatively high yielding securities, particularly now during a period of low interest rates.

Within the renewable power generating sector, we believe opportunities are particularly attractive for distributed utility-scale power generation projects, that is projects of less than 25MW for non-rooftop solar photovoltaic and less than 100MW for onshore wind.

One of the benefits of distributed utility-scale projects is that they are sited close to the end-users of the power and as a result do not rely as heavily on the electricity transmission grid compared to large-scale utility projects. Consequently these facilities are able to mitigate a significant portion of the mark-up from transmission and distribution costs while still pricing close to retail power prices.

The appeal of the global renewable sector among institutional investors is also being enhanced by changing investor attitudes towards fossil fuels and the transition required towards a low carbon economy. This is a topic we explore in the climate risk article that features earlier in this report.

However, uncertainty towards the path of U.S. environmental legislation and its implications for the U.S. renewable sector has grown since the U.S. Presidential election at the end of last year.

In our view, policy change as it relates to the coal and renewables sectors are focused on the elimination of the Clean Power Plan, the repeal of energy tax credits that support the development of renewable energy and the possible withdrawal by the United States from the Paris climate agreement.

While federal legislation may become more supportive to coal and possibly less favourable to renewables, we expect state, corporate and investor level support for the U.S. renewable sector will prove resilient. This reflects improving competitiveness of renewables as well as attractive investment opportunities for the sector.

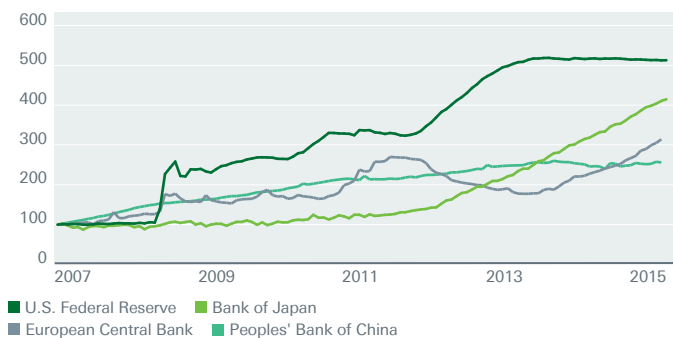
1 | Introduction

In the aftermath of the 2008-09 financial crisis and the collapse in global interest rates, institutional investors such as pension funds and life assurance companies have become more active in their search for yield. Infrastructure plays an important part in this story since as an asset class infrastructure can offer not just attractive yields, but, also match institutional investors' long-term liabilities.

Infrastructure assets consist of physical structures and essential services that facilitate in the efficient working of an economy. We typically focus on those in the transportation and utilities sectors such as airports, rail and toll roads on the one hand and water, power generation and electricity transmission and distribution on the other.

The expansion in global central banks' balance sheets and the appearance of negative real interest rates have also raised concerns among investors of an eventual pick-up in inflation, **Figure 1**. Naturally this is increasing the appeal of gaining exposure to hard or real assets such as infrastructure given their perceived inflation hedging properties. Moreover, like the micro-finance sector, there can be diversification benefits in investing in certain hard assets given the low or negative correlation of returns relative to more traditional asset classes such as bonds and equities.

Figure 1: Central bank balance sheet expansion



Source: Bloomberg Finance LP (November 2016)
Central bank total assets in local currency terms; rebased end January 2007=100

Another appeal of infrastructure assets has been rising budget deficits and the increasing indebtedness of the official government sector. This has encouraged some private sector investors to migrate into the infrastructure space, which has traditionally been dominated by the public sector, leading to the emergence of a market for Public Private Partnerships.

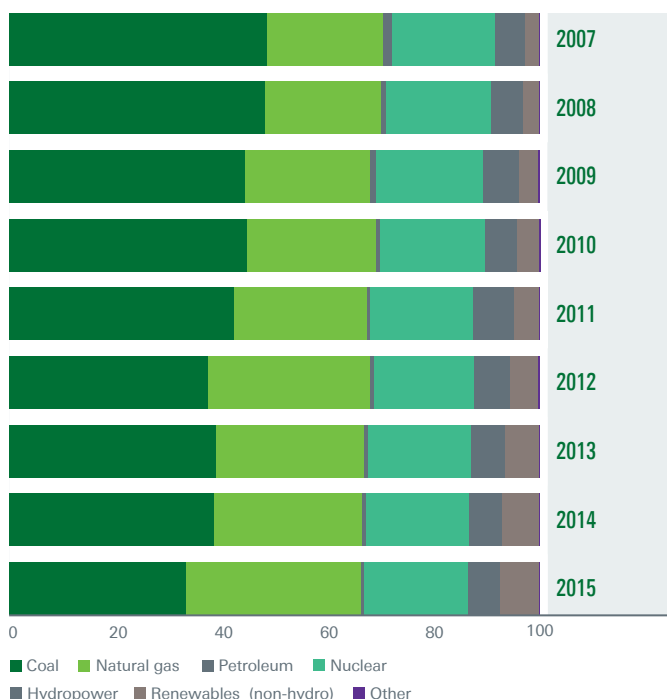
In this article, we focus on the transformation of the U.S. power sector and specifically examine prospects for the U.S. renewables sector. While the new U.S. administration may

derail federal legislation such as the Clean Power Plan, turn its back on international climate agreements and attempt to reverse the decline in the coal sector, we assess the many economic and financial factors that will continue to assist in the development and expansion of the U.S. renewables sector.

2 | The transformation of the U.S. power sector

The U.S. power generation mix has historically been dominated by coal. Indeed in 2008 coal accounted for 48.2% of total U.S. power generation by fuel type, **Figure 2**. However, since then coal's dominance has been declining such that by 2015 coal represented just 33.2% of the U.S. power generation mix, according to data published by the U.S. Energy Information Administration (EIA).

Figure 2: U.S. power generation mix by fuel type (%)

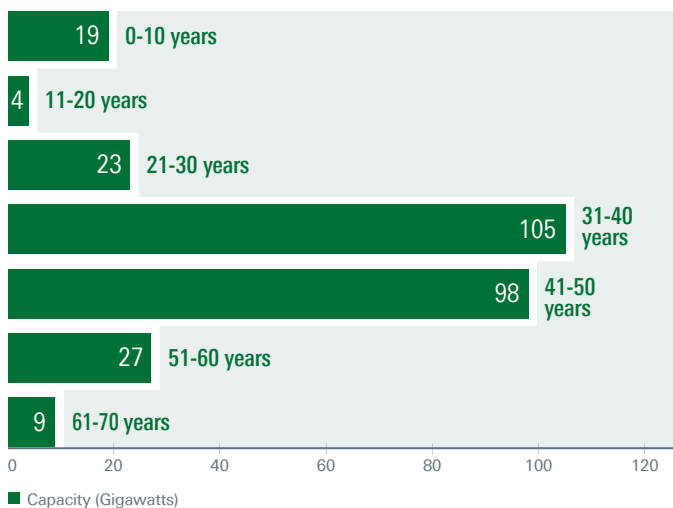


Source: U.S. DOE EIA Electric Power Monthly (October 2016)

According to the EIA, 2016 will see natural gas overtake coal as the main fuel source in the power generating sector. Meanwhile, the share of non-hydro renewables, that is wind, solar, biomass/waste-to-energy, geothermal and tidal energy generation, will have increased from 3.1% in 2008 to a projected 8.8% by 2017 according to the EIA.

The decline in coal and the increasing penetration of renewables in the power generation mix have been driven by a multitude of factors. Firstly, the retirement of coal-fired power generation, a result of the uncompetitiveness of coal and its aging infrastructure. Wood Mackenzie data show that 70GM of coal-fired generation was closed between 2008 and 2016 and estimates made before the U.S. Presidential result, indicated a further net closure of 29.5GW from 2017 to 2024. This scale of decommissioning is in part a function of aging infrastructure. According to the EIA the capacity-weighted average of U.S. coal-fired power generating capacity is currently 38.6 years, that is close to the end of its typical lifespan, Figure 3.

Figure 3: U.S. coal-fired generation capacity by age



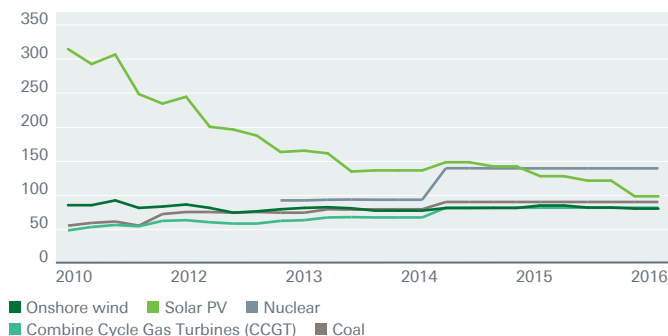
Source: U.S. Energy Information Administration

U.S. efforts to reverse decommissioning coal plants may be achieved by scaling back any further tightening in emission standard regulation, such as the repeal of the Clean Power Plan. However, we expect this may simply help to extend the life of existing coal fired power generators rather than stimulate new power generating capacity. We examine the potential implications of a Trump Presidency on coal-fired power generating capacity in sector 4 of this article.

A second factor increasing the share of renewables in the power generation mix has been the rapid decline in cost curves for renewable technology. For example, the cost of solar panels has fallen 65% in the five years to 2015, while the cost of wind turbines has fallen by approximately 23% over the same period. Combined with falling installation costs, this

trend has resulted in a declining overall levelized cost of electricity (LCOE) for renewable energy projects, Figure 4. Lower LCOE has resulted in renewable energy projects becoming increasingly cost competitive with coal, natural gas, nuclear energy and other traditional forms of electricity generation on a wholesale basis, that is excluding transmission and distribution (T&D) costs.

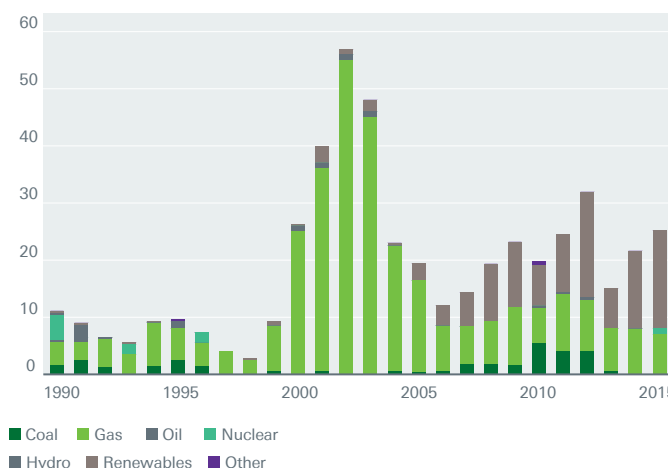
Figure 4: Global average levelized cost of energy (LCOE)



Source: Bloomberg New Energy Finance (April 2016)

The increasing cost competitiveness of renewables is evident in the mix of new power generating capacity coming on line. Since 2005, renewables have accounted for almost 50% of new power generating capacity additions with natural gas constituting the bulk of the remaining share at 42%, Figure 5.

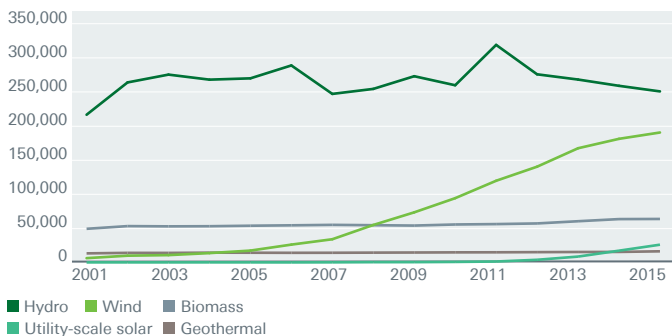
Figure 5: U.S. power generating capacity additions by fuel type (Gigawatts)



Source: Bloomberg New Energy Finance (April 2016), EIA

If we examine capacity additions by technology we find that wind and solar have captured the lion's share. Between 2008 and 2012 wind dominated capacity additions among the various renewable sources, representing just over 80% of the total. On current trends, wind could overtake hydro as the most prevalent renewable energy source by 2019.

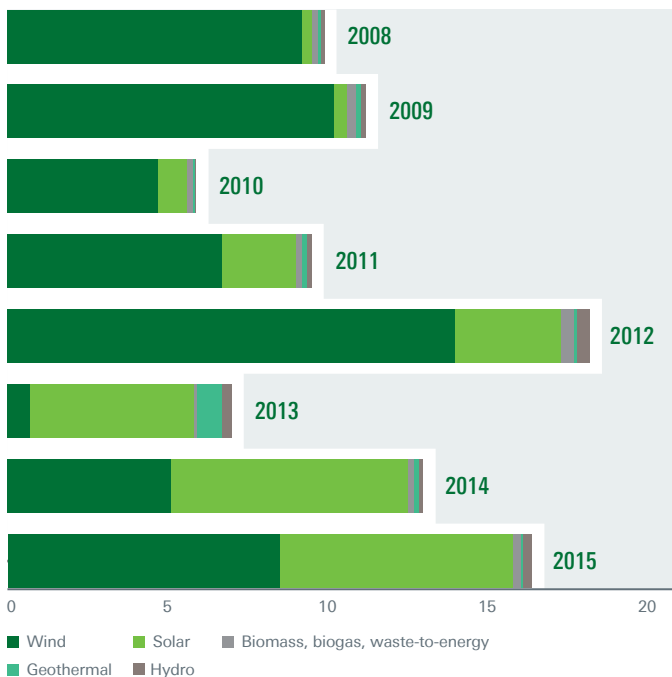
Figure 6: U.S. renewable electricity generation by energy source (GWh)



Source: U.S. DOE EIA Short Term Energy Outlook (October 2016)

However, since 2013 solar has been making increasing inroads such that it has accounted for approximately 55% of renewable capacity additions, compared to 13% in the previous five year period, Figure 7.

Figure 7: Renewable capacity additions by technology (Gigawatts)

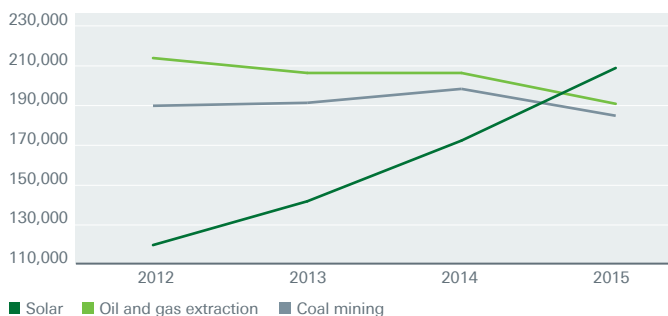


Source: Bloomberg New Energy Finance, EIA

The rapid growth in solar over recent years is also evident in U.S. employment figures such that the number of people employed in the U.S. solar sector has risen by over 60% in the three years to 2015. As a result, in 2015 more people were

employed in the solar sector than in the domestic U.S. oil and gas extraction sector or the domestic coal mining sector, Figure 8. We would expect that this will limit the extent to which the new Trump administration may wish to make major cuts to key renewable energy incentives such as Production Tax Credit (PTC) and Incentive Tax Credit (ITC), which are energy tax credits that support the deployment of renewable energy. As we discuss later, Trump voters are strong supporters of expanding the renewable sector.

Figure 8: Number of people employed in the U.S. solar, oil and gas and coal mining sectors compared



Source: International Renewable Energy Agency, Renewable Energy and Jobs Annual Review 2016 (May 2016); U.S. Bureau of Labor Statistics, Bloomberg Finance LP

Aside from the retirement of coal fired power plants and the rapid decline in cost curves for renewables, power price hedging has also become a key driver of market growth within the renewable sector. This reflects large power customers seeking to mitigate the sizeable swings in electricity and commodity prices by directly contracting for renewable power at fixed power prices over long-term (20-25 year) periods.

Within the overall U.S. renewable energy market, we believe the distributed utility-scale (DU) generation sector is one of the bright spots in terms of investment opportunities. DU generation refers to power projects of less than 25MW for non-rooftop solar photovoltaic and less than 100MW for onshore wind. Such facilities tend to be sited close to the end-users of the power and consequently do not rely as heavily on the electricity transmission grid compared to large-scale utility projects. As a result, these facilities are able to mitigate a significant portion of the mark-up from transmission and distribution costs while still pricing close to retail power prices, resulting in attractive project economics.

Retail power prices, the basis upon which distributed-scale renewable energy projects compete with traditional power generation, tend to be approximately 50-55% higher than wholesale power prices. This is due to T&D costs, that is the cost of maintaining energy infrastructure required to deliver power to end-users as opposed to the costs of the coal, natural gas or other underlying commodity used to generate the electricity.

In 2015, more people were employed in the U.S. solar sector than in the domestic U.S. oil and gas extraction sector or the domestic coal mining industry.



As a result, even as commodity prices have declined and remained subdued over the past two years, acting as a drag on wholesale power prices, U.S. retail power prices have tended to hold steady or even increase over the same period. Indeed over the past decade, although U.S. natural gas wholesale prices have fallen by approximately 86%, peak-to-trough, retail power prices in the U.S. have increased by approximately 20%. This is because natural gas-based power, although currently inexpensive at the wholesale level, relies on T&D to ship power from centralized power plants to retail customers and therefore incurs T&D-related costs at the retail level.

By siting generation close to or at the source of end-user power consumption, distributed utility-scale energy projects are able to largely avoid this 50-55% T&D mark-up. Siting generation next to the load can also help avoid potential congestion charges, which can be incurred when power flow is constrained due to transmission capacity limitations. The farther a project is sited from the load, the more likely it is that this type of charge may be incurred. In our view, these cost advantages are one of the key factors driving the appeal of distributed utility-scale renewable energy projects.

Other factors creating tailwinds for distributed utility-scale generation is the increasingly aged T&D infrastructure across North America, with 70% of transmission lines and power transformers in the U.S. now 28 years or older. As a result, dollar investments in U.S. transmission have increased every year from 2008 to 2014, with 2014 transmission investments more than doubling those of 2008. The Edison Electric Institute

forecasts this trend to continue, with over USD 58 bn in total investment projected for the 2015-2017 period.

As this trend continues, distributed utility-scale renewable energy offers significant benefits, not least by removing strain from the aging, centralised energy transmission infrastructure. In time we expect this to also increase distributed utility-scale renewable energy's attractiveness to utilities which are struggling with operational, regulatory and permitting challenges associated with T&D upgrades and new investment.

On the regulatory side, utilities continue to be subject to requirements intended to increase their consumption of renewable energy. According to the National Renewable Energy Laboratory, 29 U.S. States have Renewable Portfolio Standards (RPS), which are state-level regulations requiring local utilities to derive a certain percentage, variable from state to state, of their electricity generation from renewable sources by certain specified dates.

3 | Renewables and the U.S. political landscape

Before the U.S. Presidential election result last November, the U.S. Environmental Protection Agency's forecast that the share of renewables, including hydro, in the U.S. power generation mix would rise from 14% in 2015 to 28% by 2030, and that this would be entirely driven by non-hydro renewable capacity growth.

However, the new Republican administration has introduced fresh uncertainty as it relates to environmental legislation and consequently these targets. In our view, policy changes relevant for the coal and renewables sectors are the elimination of the Clean Power Plan (CPP), the repeal of certain energy tax credits and the withdrawal from the Paris climate agreement.

Similar to previous emission standard regulation, the CPP if approved would have imposed stricter emission performance standards for new, modified and re-powered power plants. Consequently its repeal may assist in sustaining the operation of certain coal-fired power generation and slow the pace of coal-fired power generating decommissioning. However, in isolation its repeal is unlikely to alter the poor fundamentals of the coal sector since decommissioning will continue given the age of coal-fired facilities in the U.S..

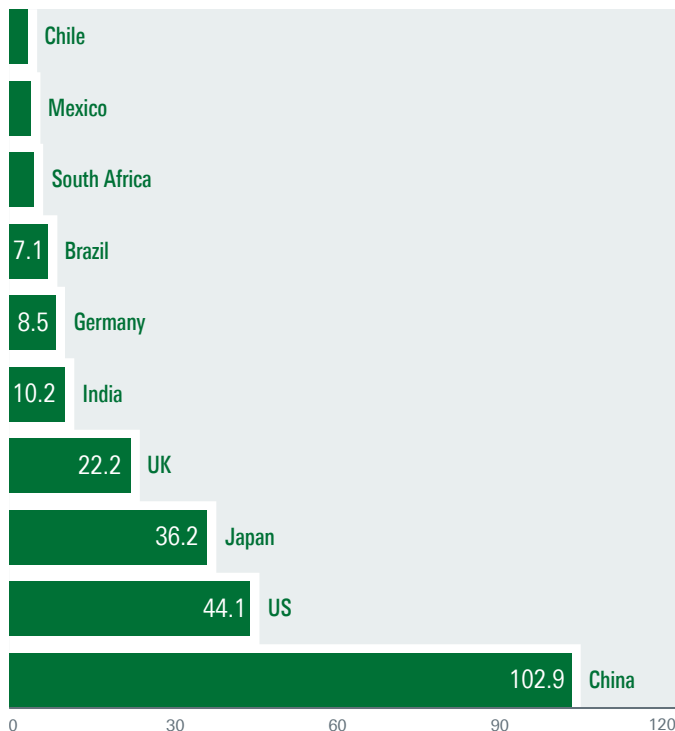
In addition, even under the scenario where the CPP has been repealed, building new coal generating capacity will still be hard to justify due to the nature of the valuation methodology of long term assets with a 50 year life expectancy. Another economic reason against the revival of coal is that renewable energy’s equipment cost is projected to continue to decline, by as much as 40-60%/watt depending on technology, out to 2040.

Aside from the elimination of the CPP attention is also focused on the repeal of Production Tax Credit (PTC) and Incentive Tax Credit (ITC). These are energy tax credits that support the deployment of renewable energy with a production tax benefit primarily for wind projects and an investment tax incentive primarily for solar projects.

Any repeal would require congressional approval and Congress would also have to consider that such action would more likely curtail jobs growth in the renewables sector rather than boost jobs growth for the coal sector. Since PEW Research Center polls show Republican voters have been strong supporters of expanding the renewable sector, we would view legislative action that is focused on boosting domestic coal production as more likely than the repeal of federal tax incentives for the renewables sector.

Finally, a decision by the U.S. to withdraw from the Paris climate agreement would cede even greater leadership and strategic advantage to China. Indeed China already leads the world in clean energy investment, **Figure 9**, and employs over 3.5 million people in the sector.

Figure 9: New investment in clean energy by country (USD bn, 2015)



Source: UNEP, Bloomberg New Energy Finance, Global Trends in Renewable Energy Investment (March 2016)

Walking away from the Paris climate agreement could take up to 3-4 years. In addition, many greenhouse gas emission reduction initiatives in the U.S. are already occurring at a state level such as the Renewable Portfolio Standards. For example, New York and California have set targets that renewable energy must account for at least half of their energy source by 2030.

We are seeing an increasing number of U.S. corporates, such as Google, Apple and WalMart, striving to reduce their emissions as well as source an increasing share of their power supply via renewables. Investors are also increasing their investments in clean energy projects in part due to increased scrutiny on fossil fuel holdings. In the extreme, this is leading to outright divestment from fossil fuels. This includes California’s state legislature instructing public pension funds in the state to divest holdings in companies that generate at least half of their revenue from coal mining by July 2017.

4 | Conclusion

The past few years has seen a significant transformation in the U.S. power generation mix as coal use has peaked and natural gas and renewables have prospered. Renewables have benefited from declining cost curves, a desire among power producers to diversify into renewables and increasing demands at a state, investor and consumer level requiring the adoption of renewable energy.

We believe growth in the U.S. renewable sector presents an attractive investment opportunity with distributed utility-scale projects a particularly bright spot. We also expect a Trump Administration will not derail what is one of the fastest growing segments of the economy, when measured in employment terms.

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References

Deutsche Asset & Wealth Management April 2015. Why Invest in Infrastructure?

International Renewable Energy Agency (May 2016). Renewable Energy and Jobs, Annual Review 2016

Renewables have benefited from falling cost curves and increasing demands at a state, investor and corporate level requiring the adoption of renewable energy.





**DEVELOPMENTS AND
NEW HORIZONS FOR
SUSTAINABLE REAL ESTATE**

Real estate is an asset class with amongst the strongest reasons for incorporating sustainability into investment decision-making. This reflects the strong link between sustainability and financial performance, developments in the areas of investor requirements, government policies and tenant demand among others. Looking ahead, significant investment will be required in the commercial real estate sector to reduce energy use of buildings which would enable the sector to play a fair role in implementing the Paris Climate Agreement. Efforts to reduce emissions could also be achieved by investors working with governments to improve urban infrastructure and reducing urban sprawl. Developing methods to measure the sector's positive societal is likely to grow in importance.

Executive summary

In our view, real estate is the asset class with amongst the strongest reasons for incorporating sustainability into investment decision-making. This stems from the strong link with financial performance, developments in the areas of investor requirements, government policies, tenant demand and the growth of smart data technologies. An ESG real estate strategy can preserve and enhance risk-adjusted returns and strengthen the investment process. With growing investor allocations to real estate, we examine the drivers that are strengthening the case for incorporating ESG in the real estate sector.

Compared to other asset classes, Deutsche AM's (2015) extensive review of academic evidence in this area reveals that real estate has the strongest positive link between financial performance and ESG. As investor requirements for ESG integration continues to grow, real estate investors have rapidly adopted Global Real Estate Sustainability Benchmark (GRESB) for evaluating their portfolios' approach to incorporating ESG in the investment process. We estimate that the global commercial real estate sector will need to make at least EUR 850 bn investment to reduce the energy use of their buildings over the next 15 years in order to play a fair role in implementing the Paris Climate Agreement (Deutsche AM analysis Dec 2016, IEA Nov 2014).

This article also undertakes a comparison between Deutsche AM's recommended global geographic real estate portfolio allocation with a ranking of countries' green building policies. We conclude that 29% of a model portfolio allocation is to countries with the strongest green building policies and 35% is to countries with the second strongest ranking of policies (Deutsche AM analysis Dec 2016).

Low-carbon policies covering buildings continue to expand and strengthen as governments seek cost-effective ways to reduce energy consumption for reasons of energy security, job creation and reducing carbon emissions. Government policies could accelerate low-carbon technology investment in commercial real estate by reforming building energy labels

to include operational performance of buildings. Energy labels should essentially become electronic building passports. Governments may increasingly set deadlines after which inefficient buildings will not be able to be sold/leased. Investors will have to invest to improve or sell their most inefficient buildings.

Tenant requirements are amongst the most important drivers for sustainability in the real estate sector. We expect this trend will continue, particularly as research shows that better indoor air quality can improve worker productivity by between 8 to 11% (World Green Building Council 2014).

From section 5 of this article, we conclude with a discussion of 'new horizon' issues that are growing in importance for the sector:

1. Considering how investors can work with governments to improve urban infrastructure and reduce urban sprawl, as better urban infrastructure can enhance property asset valuation and is essential for meeting sustainability objectives
2. Setting energy/carbon reduction targets for real estate portfolios in line with the Paris Climate Agreement. A common industry-wide methodology for setting 2°C targets would be beneficial
3. Improving measurement of the sector's positive societal impacts, beyond energy efficiency, renewable energy and the number of green labelled buildings

More than a third of the global real estate investment industry was assessed on sustainability practices and policies in 2015.

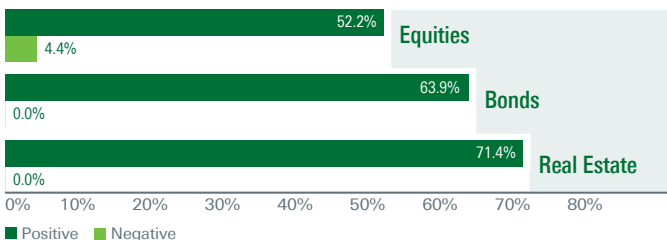


1 | Green buildings & yield

Deutsche AM and the University of Hamburg's December 2015 whitepaper surveyed 2,250 academic reports which examined the link between Corporate Financial Performance (CFP) and Environmental, Social and corporate Governance (ESG) factors. One of the most compelling findings was the disproportionately positive impact of integrating ESG into real estate investment.

Of the seven studies that focused on the link between CFP and green real estate, five (71%) found a positive relationship with financial performance with the remaining two studies finding a neutral relationship. This compared with more than 1,000 studies of equity funds where 52.2% find a positive relationship with financial performance and only 4.4% held a negative relationship, **Figure 1**. Interestingly other green real estate studies which have been published after the cut-off dates for the Friede, Busch and Bassen study, revealed similar findings. Given the limited number of studies available for real estate relative to other asset classes, further studies would help to strengthen the linkage.

Figure 1: ESG and financial performance: survey of academic evidence



Source: Friede, Busch and Bassen (Dec 2015)

At a project level the benefit of energy reduction measures can be clearly understood. For instance, to value the benefit of the retrofit project, one can simply look at the cost versus the projected energy savings to develop a return on cost and/or a project payback period. For the past four years, Deutsche Asset Management's real estate business invested several million dollars a year into technologies to reduce our building's energy use.

Our analysis shows that these investments created a 20%+ return on investment (Deutsche Bank 2016-17).

However, particularly with multi-let properties, the challenge becomes understanding how much of the value of such projects accrue to tenants versus the landlord. The answers typically involve a detailed understanding of the lease, what types of costs are recoverable to the tenants and how does the utility payment or reimbursement function for a particular building. In the longer term, retrofits can potentially enable landlords to charge rent premiums by reducing the operating expenses for the tenant.

An assessment of a comprehensive green retrofit of a Paris office building found that the investment enabled the owner to increase its rental revenue due to a green premium in rental prices, decrease future depreciation risks, and enabled the investor to nearly double the initial value of the building. A traditional payback calculation would not account for these benefits (Kamelgarn and Hovorka Jan 2013, p.45-46). One often cited U.S. report found a 3% rental premium and 13% sales premium for green buildings (Eichholtz, Kok, Quigley, 2011).

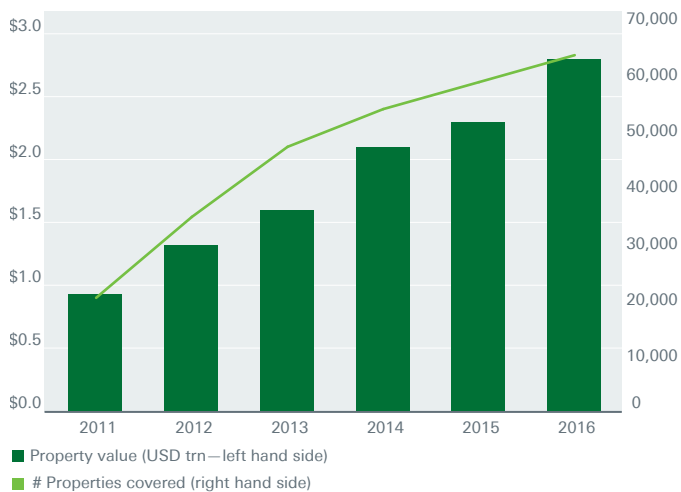
2 | Investor requirements

Many institutional asset owners are increasingly requiring integration of sustainability in the investment process across all asset classes—including real estate. The Principles for Responsible Investment (PRI) found that 69% of asset owners' had ESG requirements for real estate asset managers in 2014-15. Across all asset classes PRI found that responsible investment activity is more widespread than ever, but needs further integration (PRI 2015).

There is also growing investor willingness to have their ESG investment process evaluated. The strongest indicator of this is found in the growing participation in the Global Real Estate Sustainability Benchmark (GRESB 2016) survey, as shown in **Figure 2**. GRESB is a science-based benchmark to measure the environmental performance of property portfolios, which

evaluated a record USD 2.8 tn in assets in 2016. This compares with USD 7.6 tn of assets owned by commercial real estate investors, thus **more than a third of the global real estate investment industry was assessed on sustainability practices and policies in 2016.** This industry-led initiative aims to enhance shareholder value by increasing transparency regarding portfolio level ESG integration.

Figure 2: Properties evaluated in the GRESB survey

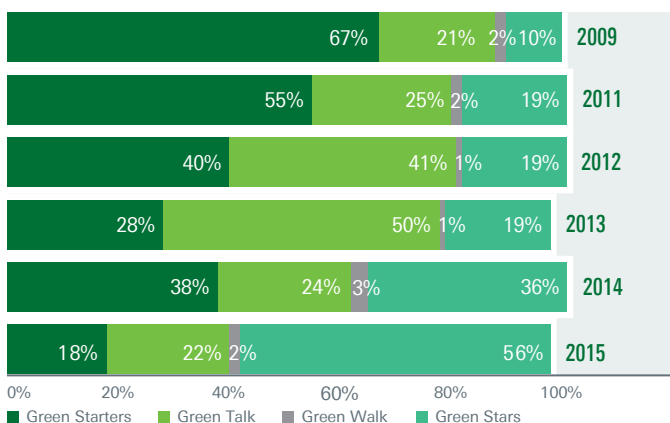


Source: GRESB (Sept 2016)

The real estate industry has been continually improving its score as can be seen in Figure 3. Increasing numbers of investors have moved from GRESB’s lowest score of a ‘Green Starter’ to a mid-score of ‘Green Talk’ and then receiving the highest ranking of ‘Green Star’.

Asset owners are using performance on GRESB surveys to help inform their decisions to award mandate contracts to real estate asset managers. However, a Mercer global survey of 97 institutional investors found that there is still some way to go on this front with only 27% of investors are significantly incorporating ESG into real estate manager selection, 56% to some extent and 17% not at all (Mercer 2015).

Figure 3: Evolution of GRESB real estate ESG scores



Source: GRESB (2015)—note: no survey was conducted in 2010.

3 | Government policies

The Paris Climate Agreement is likely to accelerate policies targeting energy consumption in buildings as 30% of global energy use and 40% of global carbon emissions are attributable to buildings (IEA 2014).

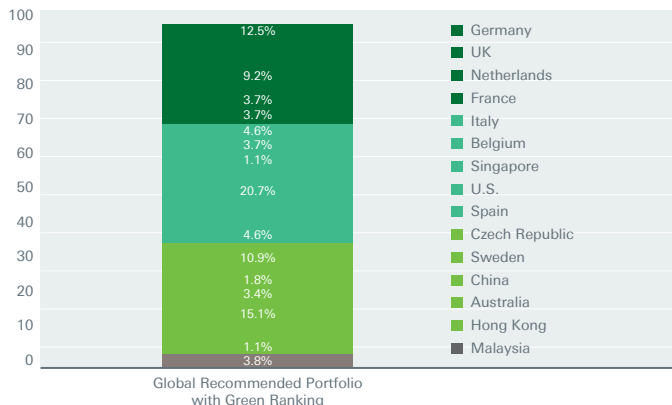
To evaluate how green building policies affect a geographically diversified real estate investor, this section compares Deutsche AM’s Global Real Estate Strategic Outlook (2016) annual recommendations for a geographic real estate portfolio allocation with an evaluation of green building policies in major countries.

Deutsche AM’s recommended portfolio allocation provides a generalized framework for international investing relative to an investor’s local returns and the relative purchasing power of their home currency. The aim of this framework is to start a discussion on an appropriate investment plan which can identify those regions, markets and property sectors that may complement an investor’s domestic portfolio and can either improve performance, reduce risk, provide diversification or achieve a combination of all three. The generalised global allocation is used in this comparison, while the Global Real Estate Strategic Outlook provides currency hedged recommendations depending on the investor’s domicile.

In March 2016, the law firm Baker & McKenzie published its second evaluation of green building policies across a number of policies including green certificates, incentives, targets and green leases. Germany, the UK, the Netherlands and France were the top ranked countries. The U.S. appeared in the ‘mid-green’ category, but is marked down as most of its policies are governed at a state or city level. Many of the U.S. cities which are target markets have strong green building policies.

Figure 4 indicates that **29% of a model portfolio allocation is to countries with the strongest green building policies and 35% is to countries with the second strongest ranking of policies (see Annex for note regarding methodology).** These markets are amongst the most important in a diversified investment portfolio. **We expect that green building policies will continue to expand and strengthen.**

Figure 4: Deutsche AM’s recommended global real estate portfolio allocation, ranked by Baker & McKenzie’s Global Sustainable Buildings Index



Source: Deutsche AM (2016) and Baker & McKenzie (2016)

Major changes to building policies are originating from the EU as the European Commission issued a package of energy efficiency proposals in December 2016, including a 2030 energy efficiency target, a review of the Energy Efficiency Directive (EED), and proposals to improve the Energy Performance of Buildings Directive (EPBD). These proposals will now be debated by the European Parliament and European Council of member state governments before being implemented by European countries. We intend to examine these proposals in a future publication.

However, an indication of the direction that these policies could take can be seen in the recommendations of the European Institutional Investors Group on Climate Change (IIGCC, where Deutsche AM is a member). We briefly describe several of the IIGCC’s recommendations. IIGCC suggested that the EU should use these reforms to “set a binding goal to bring the entire European buildings sector to a nearly-zero energy/carbon standard by 2050”.

Buildings in Europe are already required to have an Energy Performance Certificate (EPC) that rates a building from ‘A’ (most efficient) to ‘G’ (least efficient) with the rating valid for ten years. However, IIGCC also recommended that Europe use the EU’s proposals to ensure that EPCs cover design and operational performance and be more frequently updated to become a dynamic, electronic buildings passport with more commonalities across EU member states. The aim could be to help address some of the gaps between building rating systems and the drivers for investors to improve the energy efficiency of buildings (IIGCC 2015).

For instance, a Deutsche AM (2012) report examined how building energy labels are not always focused on metrics that matter for real estate investors. Figure 5 suggests the factors which building energy labels (such as the EU’s Energy Performance Certificates) should include.

Figure 5: Correspondence between key sustainability drivers and building rating systems

Driver	Role of Metrics	Green Building Ratings	Gov’t Ratings
Operating Efficiency	Measure and report	Varies	Yes
Investor Mandates	Risk mitigation, capital preservation	Partial	No
Regulations & Incentives	Demonstrate compliance	No	Varies
Tenant Demand	Total occupancy cost, green label	Partial	No
Market Positioning	Identify local market value	No	No

Source: Deutsche AM (October 2012)

IIGCC recommended that better Energy Performance Certificates could become the foundation for new building regulations. The UK, Netherlands and France have policies which require buildings to have a minimum level of energy performance in order to be allowed to be leased or sold.

IIGCC recommends that the EU policy draw on these policies to create a requirement to phase-out/retrofit the most energy inefficient buildings. For instance, the UK government estimated a GBP2.9 bn net present value benefit for business as a result of not allowing F and G rated properties to be sold or leased after 2018 (DECC 2015). The investor group is encouraging Europe to create a similar requirement as the UK’s Minimum Energy Performance Standard for buildings (IIGCC March 2016).

In the U.S., energy efficiency policy-making occurs on multiple levels of government, and as a result, despite political headwinds that may occur at the federal level, there has been a continued trend towards more regulations around energy efficient building stock. Federal bodies including the Environmental Protection Agency and the Department of Energy have primarily been involved in setting broad guidance and developing initiatives to stimulate further activity with respect to energy efficiency. However, under the Trump administration, there have been signals of a potential restructuring of certain key initiatives currently receiving federal funding. For instance, in the release of its first budget proposal, the Administration called for the de-funding of the EPA Energy Star program, which sets energy efficiency standards for appliances, electronics, houses and buildings.

While there is uncertainty as to the potential outcomes of federal agency changes, its impact on the efficiency market is buffered by growing policy making at the state and local level. Furthermore, as states are typically charged with regulating public utilities in the U.S. as well as regulating building codes, states are often better positioned to either incentivize or require further efforts around energy efficiency. According to the American Council for an Energy-Efficient Economy (ACEEE 2017),

there are 26 states in the U.S. that have developed significant policies around an energy efficiency resource standard. These policies typically mandate an energy savings goal for the state and are accompanied by incentives for carrying out efficiency projects. In addition, several of the largest cities, including New York, Boston, Philadelphia, Boston, Chicago, and Los Angeles have mandated energy use benchmarking of public, commercial and multifamily buildings (IMT, 2017).

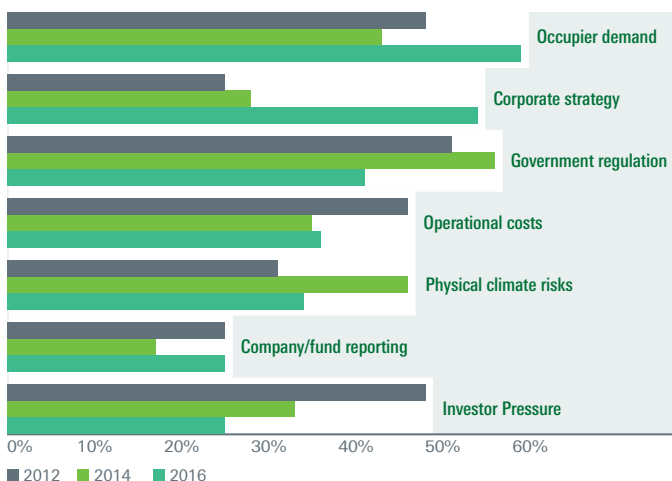
We estimate that the global commercial real estate sector will need to make nearly EUR 850 bn investment in energy efficiency over the next 15 years to play its fair role in implementing the Paris Climate Agreement. This estimate is based on IEA’s forecast of the energy efficiency investment required to align the commercial real estate sector with the Paris Climate Agreement (2014, see Annex A). IEA estimates that USD 4 tn is required over 2014-2035 to improve buildings’ energy efficiency. UNEP (Dec 2015) estimates that the total value of all owned property is USD 95 tn, of which 21% or USD 20 tn is commercial real estate. Thus we assume that 21% of the USD 4 tn in energy efficiency investment will be needed in the commercial real estate sector – EUR 842 bn. This may understate the investment required as it may be easier to undertake higher investment in commercial properties than in all of the billions of residential buildings.

4 | Tenant demand

Tenants are also an important driver for green buildings as increasing numbers of organisations have corporate policies that influence their selection of business premises. Part of the reason for this may be due to the evidence that green buildings with better indoor air quality can create health and well-being benefits which can translate into improved worker productivity, as well as reducing energy and other operating costs.

A recent UK survey of fund managers, **Figure 6**, found that tenant demand was the strongest reason for integrating sustainability in to real estate. It is thus not surprising that 66% of GRESB (2015) respondents provided tenants with a sustainability guide and practical advice for their building.

Figure 6: Reasons for integrating sustainability into real estate assets



Source: Biffinger/GVA June 2016

The World Green Building Council (2014) conducted a comprehensive survey of how worker health and productivity is higher in green offices. The report found:

- Better indoor air quality can lead to productivity improvements of between 8–11%
- Modest degrees of personal control over thermal comfort can return single digit improvements in productivity and improve workplace satisfaction
- Views from windows can improve productivity
- Poor acoustics can be a major cause of dissatisfaction
- Office configuration can have an impact on worker concentration, collaboration, confidentiality and creativity
- Building amenities (gyms, bike storage, green space) can encourage healthier lifestyles

This evidence indicates the likelihood that major will accelerate major tenants' tenants will accelerate their focus on green offices as they seek good work environments for their staff.

In order to unlock further sustainable building projects in tenant spaces, landlords have begun to draft and offer green leases to tenants. Although green lease language may vary, the fundamental requirement is that the landlord can recover from tenants the cost of energy efficiency upgrades to the building. The benefit of green leases is that it overcomes the challenge of split incentives traditionally faced in commercial real estate. Although the landlord typically makes the capital investments in buildings to improve energy performance, the cost savings associated with the improvements inure to the tenant. A green lease aligns the incentives between landlord and tenant to make more efficiency projects financially feasible for both parties. It can also be a beneficial way to lay the groundwork for sustainable building investment plan by addressing the topic during the course of the lease discussions. A study by the Institute for Market Transformation (IMT, May 2015) estimated that green leases in the US could potentially provide between USD 1.7 bn and USD 3.3 bn in energy cost savings.

In 2015, Deutsche Asset Management was recognized as a Green Lease Leader by the IMT and the U.S. Department of Energy's Better Building Alliance for its work in implementing green leases as part of its standard documentation.

5 | New Horizon: smarter urban development

A focus on energy efficient green buildings is not a sufficient condition for a sustainable real estate sector. Green buildings are an improvement environmentally, but, not by much if they are located in a sprawling urban development that requires the building occupants to undertake long, single occupancy vehicle commutes. Cities account for about two-thirds of primary energy demand and 70% of total energy-related carbon emissions (IEA 2016).

The importance of green, smart, connected cities is seen in the 2014 Better Growth, Better Climate report from the New Climate Economy (NCE) Commission. The report highlights evidence from across a range of countries and from leading experts that economic growth and action on climate change can be achieved together. With the population of cities forecast to rise by 1 bn by 2030, the design and nature of investment in cities will be critical to achieving an economically prosperous and low-carbon future.

Urban development is too often characterised by sprawl and conventional single occupancy fossil fuel vehicle transport - creating significant economic and social costs as well as growing carbon emissions. For instance, comparing Barcelona, Spain and Atlanta, USA – both have approximately the same population and wealth per person but Atlanta takes up over 11 times as much land and produces six times the transport-related carbon emissions per person as Barcelona. The NCE report shows that compact, connected and diverse urban centres can create vibrant dynamic cities which are more competitive, inclusive, resilient, cleaner, quieter, safer, and also have lower carbon emissions. Such an approach has the potential to significantly reduce urban infrastructure capital requirements by up to USD 3 tn over the next fifteen years (NCE 2014).

To promote smarter urban development, the New Climate Economy and its partners have launched a Coalition for Urban Transition. The members aim to improve the quality of policy decision-making on urban transitions to meet the economic, social, and environmental objectives of national level policy makers by being an independent and objective partner for major cities.

More centrally located buildings which enjoy rich connections to transit and other public infrastructure are more valuable for investors. Mass transit investments, revitalizing urban cores, and improving walk-ability can improve returns for office, retail, and industrial properties, as the evidence in Figure 7 suggest. However, investment in improved urban infrastructure is usually a pre-condition before real estate investors are willing to deploy capital.

Figure 7: Select evidence for real estate value in compact, connected cities

Attribute	Evidence	Source
Rail & property prices	12.2% premium for U.S. commercial properties within ¼ mile of railway stations	Debrezion, Pels and Rietveld 2007
	Premium grew for retail (37%) and office (14%) properties after Dallas rapid transit investment	Carvero 2003
	120% increase in value for business district within ¼ mile of Santa Clara commuter rail station	Cervero and Duncan 2002
Walkability and property value	Washington, D.C.: one-level increase in walkability increased premiums: USD 8.88/ft ² offices, USD 6.92/ft ² retail rent, 80% increase in retail sales	Brookings May 2012
	A 10-point increase in walkability increased property values by 1–9% in a study of 4,200 U.S. buildings	Debrezion, Pels and Rietveld 2007

Source: Bilfinger/GVA (June 2016)
The examples shown are for illustrative purposes and does not represent any particular investment.

The justification and funding for urban infrastructure should draw on the value (monetary and non-monetary) from the positive externalities it generates for connected cities on citizens, companies, real estate investors, governments and the environment. For instance, reforms to zoning and entitlement frameworks should recognize the value of expanding infrastructure investment that allows the built environment to expand and improve around new transportation nodes. City policies need to create and secure the long-term revenue streams for infrastructure investors to use to deploy capital. Doing so will improve cities, reduce environmental impacts, create value for real estate investors and create investment opportunities for infrastructure investors. Thus, investors need to encourage and work with governments to create policy frameworks for smart, connected and compact urban development.

6 | New Horizon: Science-based carbon targets

While more than eighty percent of the world’s 500 largest companies have established emission reduction or energy-specific targets, few of these targets are long-term (i.e. 2030 or beyond – CDP 2015) and most are driven by organization-level commitments to act versus a scientific approach as to how to collectively combat climate change. With this realization, a number of NGOs and business groups are calling on companies to set science-based targets, which are long-term targets aligned with climate science and international agreements.

Since the aim of the December 2015 Paris Agreement is to limit climate change to well below 2° Celsius, some companies are updating their targets (often with encouragement/pressure from NGOs). Their aim is to align with the Paris goal and to give a longer term planning horizon for potential capital projects. Anticipating and preparing for stronger regulations could give an advantage to companies. As of December 2016, over 200 major companies (such as Walmart, Sony, Dell, Kellogg with a collective market cap of USD 4.8 tn) are setting ‘science-based targets’ (Science Based Targets 2016).

A number of financial services companies which have asset management arms have signed up to the Science Based Targets initiative, but it is not clear if the targets will also be applied to their real estate portfolios.

Within commercial real estate, there has been a continued emphasis on annual energy reductions. GRESB (2016) respondents reported carbon emissions of 27.9m metric tons and a 3.5% reduction from 2014. An asset owner example of action is the Dutch pension fund PGGM who has mapped the carbon emissions in its EUR 20 bn real estate portfolio (listed and private) down to individual buildings. PGGM said *“This will enable us to put pressure on fund managers to take all kinds of measures to lower the footprint. It also allows us to better value the current portfolios and also new investments”* (P&I Online 2015).

As more companies demonstrate consistent performance and systematic programs to reduce carbon emissions, we anticipate that a growing number will be capable of moving towards long-term and potentially science-based targets. The UK’s largest listed real estate company Land Securities (June 2016) was the first to adopt a Science Based target. Land Securities aims to achieve a 40% reduction in carbon intensity of real estate under management by 2030 compared with a 2013/14 baseline, which includes energy procured on behalf of their tenants. Land Securities will also reduce energy intensity of their buildings by 40%.

However challenges remain for real estate owners to adopt long-term target setting. One example is the typical hold period of assets and how that aligns with longer term goals. In portfolios where the strategy results in shorter hold periods, it may be more difficult to benchmark and track progress towards a cumulative reduction goal.

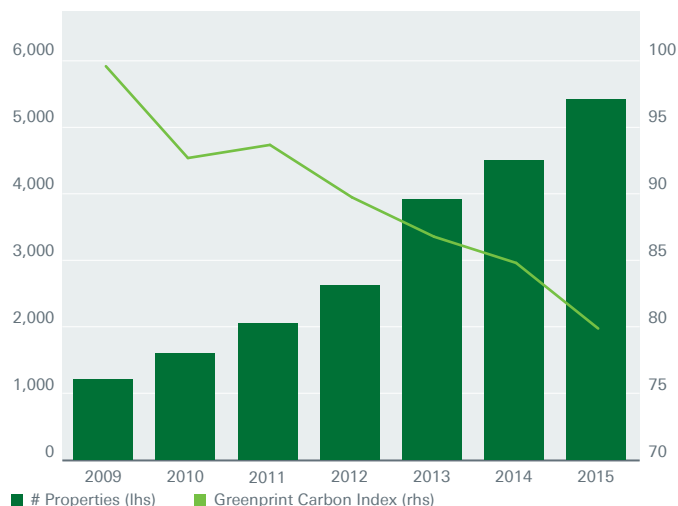
There are a number of different methodologies that have been proposed for science based targets (listed on the Science Based Targets website). We suggest that the real estate sector work to evaluate and agree on one of these methodologies that could be used and how it can be applied given the unique features of real estate.

Although science-based targets are still relatively new in real estate, there have been a few initiatives aimed at long-term energy reduction in the sector. In 2011, Deutsche AM’s real estate business committed to the Department of Energy Better Buildings Challenge with the goal of 20% improvement by 2020 across at least 5 million square feet of office space in the United States. The portfolio has demonstrated an average of 4.1% annual energy improvement and lowered energy by a cumulative 17% since the baseline year.

Urban Land Institute’s Greenprint Center for Building Performance has created a benchmark of more than 5,414 buildings in 39 countries to track the energy improvements across all of its member constituents. Greenprint has set a goal of reducing carbon intensity (per m2 floor space) by 50% below 2009 levels by 2030.

The most recent Greenprint report, Figure 8, included ‘like-for-like’ data from the buildings and shows an encouraging downward trend of carbon emissions. Deutsche AM has been a member of the organization since 2009 and contributes data to the index.

Figure 8: Greenprint Carbon Index™



Source: GRESB (Sept 2016)

Additionally, we believe some science-based targeting may be driven by a need to comply with regulations. An example of the necessity of long-term targets is seen in the UK government’s adoption in July 2016 of a ‘carbon budget’ requiring emissions to be 57% lower than 1990 levels in the 2030 time-frame. The analysis included examination of commercial buildings which add 9% to UK emissions (heat and power use). The analysis concludes that non-residential buildings will require significant investment in heat pumps and heat networks to provide half of the commercial sector’s heat

requirements by 2030, plus biomass boilers and energy efficiency. For instance, in Europe around 40% of commercial buildings are mechanically ventilated but only 7% have some form of heat recovery (CCC 2015).

While there has been a growing movement towards science-based targets in real estate, there remains questions as to the interest among investors. A 2016 survey of UK real estate investors recently asked for the climate change actions that should be prioritised over the next two years. **Figure 9** gives a low result (16%) for 'science based targets'. However, the other options in Figure 8 are exactly the actions that are necessary to implement a science based target

We interpret the low support among investors for setting science based emission reduction targets as meaning that there is low awareness of this particular phrase, how to set an appropriate long-term target and the potential implications.

7 | New Horizon: Measuring positive outcomes

Another growing area of interest in the real estate sustainability space is the development of tools to evaluate the ESG benefits and costs from investment decisions. This analysis includes understanding second-order outcomes that would not typically be included in standard cost-benefit analysis. For instance in evaluating an upgrade to the heating cooling systems of a building, a landlord would typically analyze the financial impacts of that investment, including utility costs and operating and maintenance expense. This additional analysis, sometimes referred to as triple bottom line cost-benefit analysis, would both identify and assign value the benefits of such factors as job creation, greater worker productivity or improved tenant health. The ultimate goal would be to arrive at an investment decision that takes intangible and often external factors into consideration.

We estimate that the global commercial real estate sector will need to make nearly EUR 850 bn investment in low carbon technologies over the next 15 years to play its fair role implementing the Paris Climate Agreement.



There has been growing support to use this type of analysis by key industry groups. In 2016, the Investment Leaders Group, a group of leading asset owners and managers, published a report calling for improved understanding of both positive and negative social and environmental investment outcomes. Additionally, it prepared a framework for measuring the contribution of equity funds towards the UN Sustainable Development Goals (SDGs). **Figure 9** (next page) is adapted from the ILG report and suggests ways that the real estate industry could measure its positive impact across six impact themes that are matched to the UN Sustainable Development Goals: basic needs, well-being, decent work, resource security, healthy ecosystems and climate stability.

An additional example of this type of analysis is occurring with respect to natural capital, which refers to the stock of renewable and non-renewable resources (air, water, soil, plants, minerals etc) that provide benefits for people and companies. The Natural Capital Coalition is developing guidance to help financial institutions incorporate the consideration of natural capital into lending, investment and insurance practices and processes. As society is creating more environmental impacts, this creates risks and opportunities for businesses and investors. For instance, the apparel and food and beverage industries have created sector specific guides that can be used to measure their natural capital risks and a group of 50 major companies in other sectors are also piloting efforts to measure and reduce their natural capital dependencies. The real estate sector could work to develop tools as part of this process (NCC 2016). For instance, water issues can affect the real estate sector and its tenants, whether with drought, flooding or sea level rise which can also affect ground water levels and create flooding in mass transit systems.

While it is possible to develop common measurement tools and targets across the major sustainability themes based on such a framework, another key challenge will be to create a standardized process to evaluate a variety of different projects and assign common values in each of these categories across markets and regions. Measuring the carbon emissions associated with a building's energy use is relatively straightforward, but further discussion, research and data are needed regarding how the real estate industry contributes to and measures other sustainability priorities.

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Figure 9: Potential indicators for measuring real estate’s positive environmental and social impact

SDG theme	ILG Sustainability Metric	Potential application in real estate & other relevant factors to be considered
Basic needs	Revenue from products serving low-income groups	The long-term cash flows generated from property investment provide an important source of diversified income in the portfolios of savers and pensioners. Around 40% of all European commercial property (EUR 2 tn+) is held as an investment (EPRA 2015). A minority of real estate assets provide low-income housing.
Well-being	Total tax burden* – proxy for public value contribution	The commercial property industry contributed EUR 312 bn to the European economy in 2014 (EPRA 2015). Experts could examine if a fund/portfolio could measure their contribution to this total. MSCI (2015) suggest a ‘Social Value Distributed’ methodology for banks: (total compensation – exec compensation + taxes paid + philanthropy – gov’t subsidy) ÷ total capitalization. MSCI finds that for banks, social value tends to diminish with scale. Potentially this methodology could be applied to real estate.
Decent work	Number of jobs – proxy for livelihoods supported in operations & supply chain	The European commercial property industry directly employs 3.8 million people: more than auto manufacturing and telecom combined. Employment from investment activities are a small part of the sector’s jobs but contributes 6x more value add per job (EPRA 2015). Balance of low wage jobs and potential benefits of adopting a ‘living wage’ in the real estate sector could be examined, but this could add costs for which asset owner support may be required. Common reporting standards could be developed for proportion of stable (open-ended) contracts, labour conditions, indirect job creation by a fund manager/portfolio vs industry level statistics.
Resource scarcity	Consumption of virgin material (tonnes)* – Proxy for resource burden and waste of operations & supply chain	Annual investment in new commercial property buildings and the refurbishment and development of existing buildings is estimated at EUR 249 bn in 2014 (EPRA 2015). Construction & demolition waste volume in Europe is falling but there is no uniform reporting in member states (Ecorys 2014). The UK Buildings Research Establishment has developed a construction waste monitoring tool which could be more broadly used (SmartWaste tool users diverted 6.3m tonnes of waste from landfill, saving users £19.7m – BRE 2016). Steel, copper and aluminium are responsible for 80% of all cradle to gate impact of buildings materials, even accounting for material recycling. Steel, aluminium and concrete are 68% of the embodied energy sources in building materials (Ecorys 2014). Some green building labels encourage reducing materials with high embodied energy and expanding green building materials. Compared to energy use, this may be seen as non-material compared to other drivers and priorities for green buildings – i.e. see Figure 8.
Ecosystem health	Land footprint (hectares)* – Proxy for ecosystem burden of operations & supply chain	There is no common indicator to measure building/construction impact on biodiversity. Sourcing of materials for construction may have more impact than construction itself (Ecorys 2014). Natural Capital Coalition could help the industry develop appropriate measurement tools. Despite limitations, Ecorys suggest land-take may be the best proxy for biodiversity degradation linked to construction. EEA (2015) holds data on land-take from 2000-06: 3.2% of European land area is covered by urban development, which grew 1.7%. 78% of land converted was arable and pasture lands
Climate stability	GHG emissions	GRESB (2015) respondents reduced carbon emissions 3.04%. Real estate industry could agree a ‘science based target’ methodology.

Source: ILG 2016 * ILG report states that these are proposals only, subject to further definition

References

American Council for an Energy Efficient Economy (ACEEE), January 2017. *State Energy Efficiency Resource Standards*.

Baker & McKenzie, March 2016. *Global Sustainable Buildings Index*.

BNEF/EEVS, 2016. *Report shows that behaviour change frequently delivers ‘metered’ energy savings*

BRE 2016. *SmartWaste*.

Brookings May 2012. *Walk this Way: The Economic Promise of Walkable Places in Metropolitan Washington, D.C.*: Leinberger, Alfonso.

Carvero, Robert, 2003 *Effects of Light and Commuter Rail Transit on Land Prices: Experiences in San Diego County*

Cervero and Duncan 2002. *Transit’s Value-Added effects*

Committee on Climate Change (CCC), November 2015. *The fifth carbon budget.*

Debrezion, Pels and Rietveld, June 2007. *Impact of Railway Stations on Residential and Commercial Property Value*

Department of Energy and Climate Change (DECC), 2015. *Final Stage Impact Assessment for the Private Rented Sector Regulations.*

Deutsche AM, March 2016. *Global Real Estate Strategic Outlook.*

Deutsche AM, Oct 2012. *Building Labels vs. Environmental Performance Metrics*

Deutsche Bank, 2016–2017. *Corporate Responsibility Report—ESG in real estate.*

Ecorys, May 2014. *Resource efficiency in the building sector: report for DG Environment.*

EEA, 2015. *Land-take indicators*

Eichholtz, Kok, Quigley, 2011. *The Economics of Green Building.*

Eichholtz, Kok, Younder, 2012. *Portfolio Greenness and the Financial Performance of REITs.*

EPRA 2015. *Real Estate in the Real Economy*

GRESB, 2009-15. *GRESB Report.*

IEA, 2014. *World Energy Investment Outlook.*

IEA, 2016. *World Energy Outlook*

IIGCC, March 2016. *Transforming the sustainability of Europe's building stock.*

Institute for Market Transformation (IMT), 2017. *US Building Benchmarking and Transparency Policies.*

ILG, May 2016. *In search of impact: Measuring the full value of capital.*

IPD Australian Green Property Index, September 2014.

IPD France Annual Green Property Indicators, May 2015.

IMT, May 2015. *What's in a Green Lease? Measuring the potential impact of green leases in the US office sector.*

Lewin, Manuel, June 2016. *Quo vadis, impact? Cambridge Institute for Sustainability Leadership (CISL)*

Kamelgarn, Yona and Frank Hovorka, January 2013. *Energy efficiency at the portfolio of a property owner.*

Land Securities, June 2016. *Land Securities commits to ambitious science based carbon reduction target*

Mercer, March 2015. *Global Insights on ESG in Alternative Investing.*

MSCI, June 2015. *Industry Report: Banks.*

Natural Capital Coalition (NC), 2016.

Navigant, 1Q 2016. *Intelligent Buildings*

Navigant, Aug 2016. *Intelligent Buildings Survey*

New Climate Economy (NCE), 2014. *Better Growth, Better Climate.*

P&I Online, Oct 2015. *PGGM maps CO2 footprint of real estate portfolio.*

PRI, 2015. *Report on Progress.*

PwC 2014. *Real Estate 2020: Building the future.*

Responsible Investor, 2015. *ESG Asset Owner Survey*

RICS, June 2015. *Advancing Responsible Business Practices in Land, Construction, Real Estate Use and Investment.*

ULI Greenprint 2015. *Greenprint Carbon Index.*

UNEP, December 2015. *The Value of Everything*

World Green Building Council, 2014. *Health, Wellbeing and Productivity in Offices.*

Annex: Methodology: Figure 4

The portfolio allocation relies on Deutsche AM's forecasts (as of March 2016) and there is no guarantee the forecasts will materialize. While the analysis takes into consideration our expected returns, historical volatility, correlation, relative market size and potential currency hedging costs, it does not incorporate taxes, but can serve as a general guide on deciding where to invest internationally, if at all.

The percentages in Figure 7 refer to the Global Recommended Portfolio in Exhibit 12 in Deutsche AM (March 2016). This was used for the comparison with Baker & McKenzie's (March 2016) green building policy report.

The emerging Asia allocation was evenly split between Hong Kong and Singapore. The France & Benelux allocation was evenly split between France, Belgium and the Netherlands. The southern Europe allocation was evenly split between Italy and Spain as Portugal was not ranked by Baker & McKenzie. The mature Asia Pacific allocation was set to Australia as Japan and Korea were not ranked by Baker & McKenzie. The Central and Eastern Europe allocation was only to the Czech Republic as Poland was not ranked by Baker & McKenzie. Ireland, Austria and Switzerland were also not ranked by Baker & McKenzie. The emerging Asia allocation was split 80% to China and 20% to Malaysia.

A man in a light blue shirt is drawing a red diagram on a whiteboard. The diagram consists of a vertical line with several horizontal branches extending to the right, resembling a flowchart or organizational chart. Other people are visible in the background, looking at the whiteboard. The whiteboard has various other markings, including the number '11011' in red and '25' in red. There are also some blue scribbles and lines on the whiteboard.

DIVERSIFICATION AND THE GLOBAL MICROFINANCE SECTOR

Many asset classes, such as commodities, have been lauded as possessing strong diversification properties. However, when the global financial crisis hit these alleged properties seemed to vanish into thin air. However, investigating the returns' characteristics of the microfinance sector show its diversification properties have remained intact. While the small size of the microfinance market is a potential barrier to a more widespread allocation to the sector, we expect these constraints will ease as the microfinance industry matures.

Executive summary

Microfinance describes the provision of banking services to individuals, households and small businesses at the base of the income pyramid. Microfinance also supports global efforts to increase financial inclusion, which studies show can not only spur economic activity, but, also reduce income inequality.

According to the World Bank, there are currently an estimated 2.0 bn working age adults, that is almost half of the total adult population globally, with no access to financial services. Recent research by McKinsey Global Institute (2016) finds that broadening access to financial services, particularly with digital technologies, could increase the GDP of all emerging economies by 6% by 2025 and potentially more in certain countries. This would represent additional economic growth of USD 3.7 bn equivalent to adding an economy the size of Germany and potentially creating up to 95 million new jobs in emerging economies across all sectors of the economy.

With its roots in Bangladesh in the early 1970s, the microfinance sector has grown significantly since its early days. From the narrow provision of microcredit, that is the provision of small loans to low income entrepreneurs, it now encompasses the delivery of savings instruments, mobile payment systems and micro-insurance, that is protecting low-income people from certain risks such as illness, accidents or natural disasters.

Consultative Group to Assist the Poor (CGAP) 2015 data estimate the size of the microfinance industry at around USD 70 bn and serving over 200 million borrowers. In terms of private sector funding a large proportion of this is directed through financial intermediaries in the form of microfinance investment vehicles (MIVs), which have also grown significantly over recent years. In terms of organisational structure, MIVs invest in microfinance institutions (MFIs) as intermediaries, which are typically in the form of a commercial bank, non-bank, non-governmental organisation (NGO) or cooperative. Meanwhile small, medium-sized enterprise (SMEs) financiers are mostly in the form of a commercial bank or non-bank.

Both MFIs and SMEs financing companies, which are captured in MIV portfolios, are generally regulated by their respective country's central bank, the microfinance regulatory body or a relevant financial regulatory authority.

The type of funders, that is those entities that provide finance to the institutions who then offer financial products to the end-recipient, have also evolved from NGOs and cooperatives to foundations, bilateral and multilateral agencies and more recently by an increasing number of institutional investors.

One challenge for financial inclusion is how to service SMEs since they are often referred to as the "missing middle".

These enterprises are typically too small to be serviced by local banks, given over-proportionate transactions costs and the risk being perceived to be higher than for larger corporates, and too large to be serviced by MFIs.

According to the 2016 Symbiotics Microfinance Survey, institutional investors have remained the prime funding resource for MIVs although capital from the public sector has grown significantly. Industry figures indicate that there exists a significant under-supply of microloans in the marketplace today with 2.0 bn potential micro-borrowers. As a result, there is the prospect of strong growth for the microfinance sector. McKinsey Global Institute (2016) estimates a total credit gap of USD 2.2 tn for micro, small and medium sized enterprises in emerging economies.

One growing issue and opportunity for the microfinance sector is how to support their clients in adapting to the impacts of climate change. As floods, droughts and other disasters become more frequent and intense, MFI clients will be negatively impacted. MFIs thus need to be more aware of potential climate impacts in their geographies. In cooperation with governments and development finance institutions, MFIs have an important role to play in supporting training and financial solutions that help clients adapt to and reduce the risk of climate change (Fenton 2016).

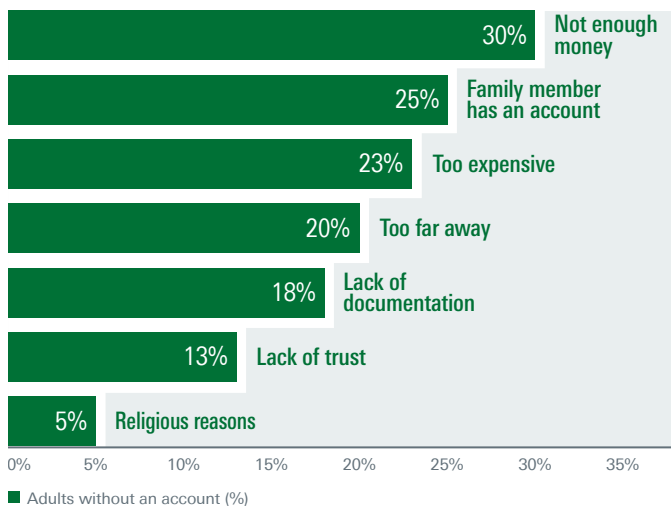
While there have been setbacks to the microfinance sector over recent years, most notably excessive lending and over-indebtedness in India, drawdown events in terms of returns have tended to be relatively short-lived and these have been followed by periods of rapid recovery.

Correlation analysis shows that MIVs have also displayed stable and predictable returns with low volatility even during the 2008/09 global financial crisis. Analysis also reveals that microfinance returns have exhibited a low correlation to traditional asset classes such as fixed income and equities and are therefore attracting increasing investor interest for their portfolio diversification properties. However, currently, the small size of the microfinance market is a potential barrier to a more widespread allocation to the sector.

1 | Financial inclusion

The World Bank defines financial inclusion as the proportion of individuals and firms that use formal financial services. It is therefore different to access to finance since some people may have access, but, choose not to use financial services. The issue is therefore the degree to which the lack of inclusion derives from insufficient demand for financial services or from barriers that impede individuals and firms from accessing services. According to a World Bank poll, tangible obstacles exist to achieve financial inclusion and **Figure 1** identifies the reasons most frequently cited for not having a bank account.

Figure 1: Reported reasons for not having a bank account



Note: respondents can choose more than one reason
 Source: Global Financial Development Report, World Bank Group (December 2014)

Financial inclusion must also be well planned since opening bank accounts that lie dormant or irresponsible credit lending practices will have at best no economic benefit or at worst increase economic instability. Evidence also reveals that for the poor it is access to savings and automated payments rather than access to credit that may be more important for poverty reduction.

Meanwhile for small and medium sized enterprises improving access to credit has been seen to be beneficial for growth. Consequently a financial sector that provides a wide range of services and products to a broad range of customers is a necessary condition for successful financial inclusion. Financial inclusion is therefore an important step in a country’s economic and social development. In 2011, the Maya Declaration was launched at the Alliance for Financial Inclusion (AFI) Global Policy Forum in Mexico with signatories committing themselves to make measurable progress to increase financial inclusion.

The significance of financial inclusion was given a further boost following the Sustainable Development Goals 2030, which were unanimously agreed by the UN Assembly in September 2015. Of the 17 Sustainable Development Goals, ending poverty, ending hunger, gender equality, sustainable, inclusive economic growth and sustainable, inclusive industrialisation seek improved or universal access to financial services as part of the solution to achieve these goals.

According to McKinsey Global Institute (2016), an estimated 75% of people live in countries where less than 5% of payments are made digitally while only 2% of the global population live in countries where more than 50% of transactions are digital. The heavy reliance on cash creates costs for financial institutions, reducing the number of customers they can profitably serve and making it difficult to assess customers’ creditworthiness. However, 80% of adults in emerging economies had mobile phone subscriptions compared to 55% who had a bank account.

The growth of ‘mobile money’ or digital financial services is a major opportunity to help address some of the issues with financial inclusion. Digital technologies can cut the cost of providing financial services by 80–90%. Many microfinance institutions are starting to work in this area but more could be done. Digital banking services including by microfinance institutions (MFIs) could add 1.6 bn people to the financial system, create USD 4.2 bn of new deposits, reduce loss of government tax revenue by USD 110 bn and lead to USD 2.1 tn of new loans.

In its Microscope 2016 report, the Economist Intelligence Unit (EIU) assessed the enabling environment for financial inclusion as well as the regulatory and structural framework for MFIs in over 50 countries. The report tracks more than 40 data points for each individual country to assess, among other things, the regulatory and supervisory environment across the financial products and services sector. It ranks countries on a 0-100 scoring system, with 100 representing the best, **Figure 2**.

Financial inclusion is seen as part of the solution to achieve many of the 17 Sustainable Development Goals including ending poverty and gender equality

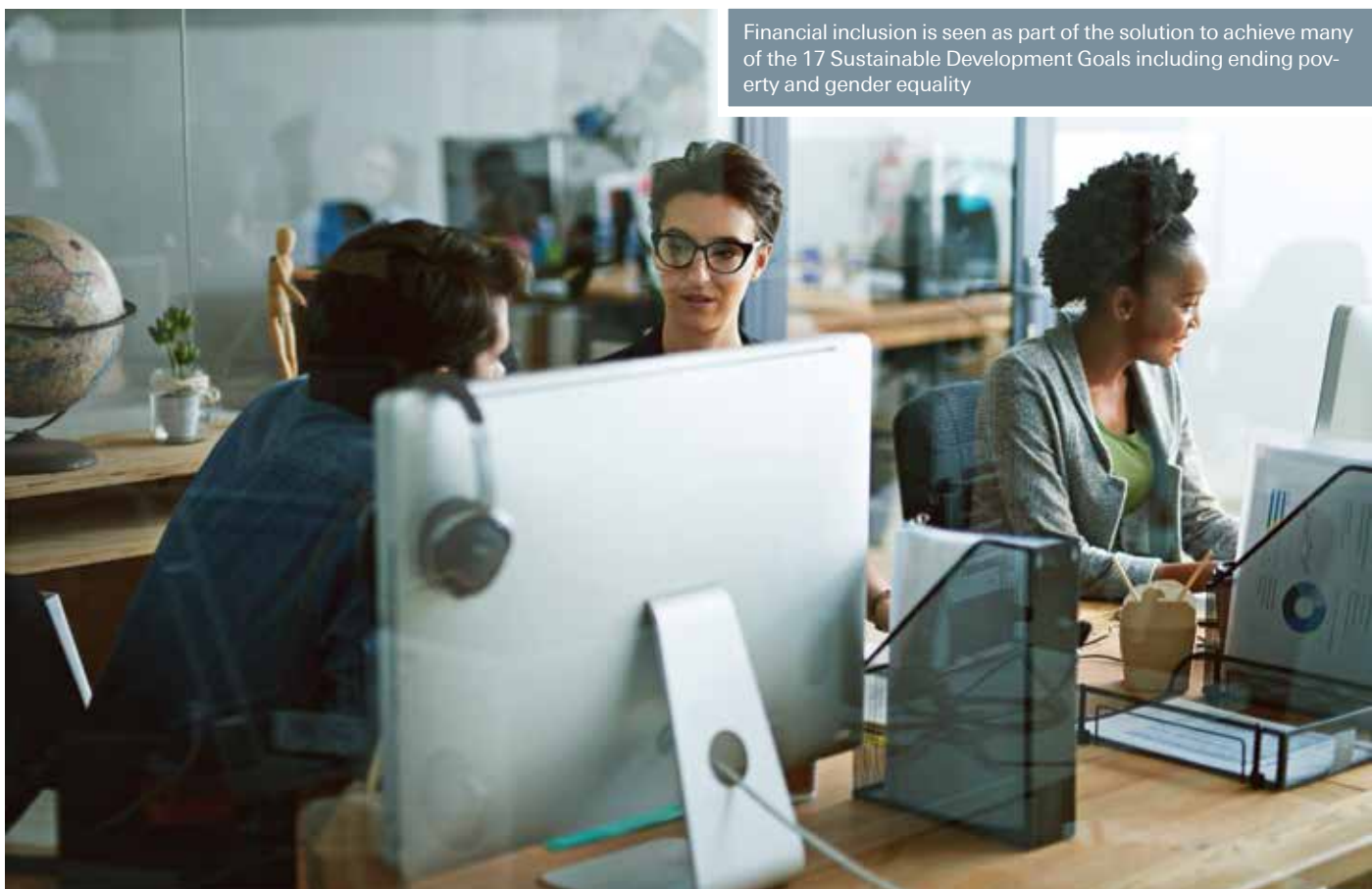
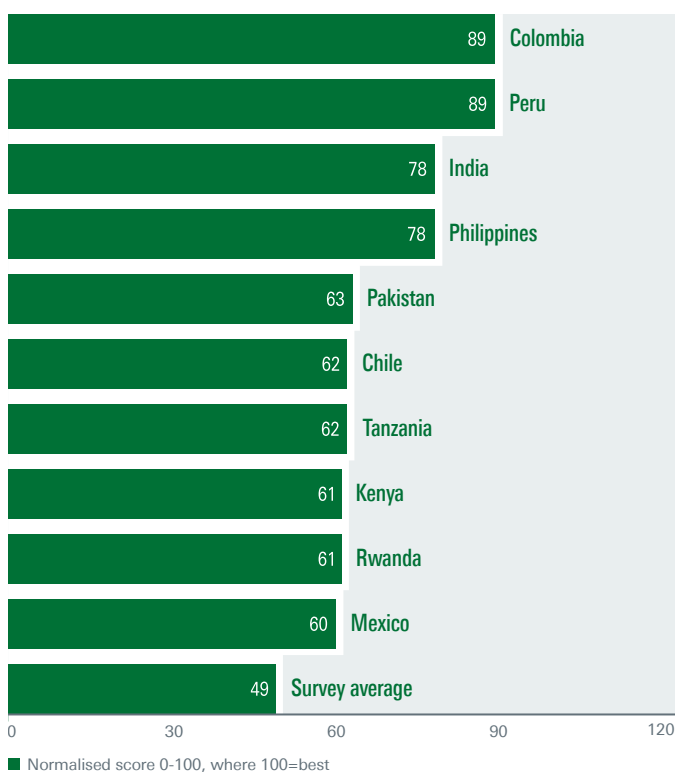


Figure 2: The top 10 countries in terms of an enabling environment for financial inclusion



Source: EIU Global Microscope 2016 (April-August 2016)

Not surprisingly, it reveals some overlap between those countries that have an enabling environment for financial inclusion and the development and size of a country's microfinance market.

The EIU report also reveals an improvement in institutional support for the safe provision of financial services to low income populations through the increased supervision of microfinance activities. MFIs may not be as rigorously supervised as the banks, but the regulatory environment is improving overall, with new codes of conduct coming into play.

2 | The history of microfinance

Microfinance is broadly speaking the provision of financial services to low-income households and small informal businesses. The scope of the microfinance sector has grown significantly since its origins in Bangladesh in the 1970s. From the early days of solely focusing on microcredit, that is small loans to low income entrepreneurs, the microfinance sector now includes the provision of savings instruments, payment systems and specifically electronic cash and micro-insurance. Indeed efforts are underway to increase the penetration of low-cost digital payment systems as technology becomes a significant facilitator in the development of the microfinance sector.

Traditional microcredit loans have been unsecured loans, which have typically targeted women borrowers in rural areas where the majority of the global poor reside. Loan amounts have tended to be very small with short contract terms (e.g., 3–6 months) and frequent repayment schedules (e.g., weekly), which gradually increase according to the clients' credit worthiness.

Historically microlending programmes were initially started by nongovernmental organisations (NGOs), such as Save The Children or CARE, and bilateral aid organisations such as USAID. Over time, and as local microfinance laws were passed, these organizations required their microlending programmes to be spun into separate formal entities. Later, the laws evolved to define pathways for these non-commercial lending entities to transform into for-profit entities that could offer a wider range of products, with more active regulatory supervision, which would eventually allow these entities to apply for a deposit license or transform further into a bank. With the surge in transformations came the opportunity for external investors to enter the

shareholding structure of microfinance institutions (MFIs), bringing in a range of social investors. This contributed to faster growth in the sector, which invited lending from microfinance investment vehicles (MIVs), who in turn lend to MFIs who then provided financial services to micro-borrowers.

These developments enabled a diverse group of funders to emerge, **Figure 3**. These ranged from foundations, bilateral and multi-lateral agencies and Development Finance Institutions (DFIs) to include, in recent years, institutional investors, commercial banks, private equity funds and individuals.

Figure 3: Examples of public and private sector funders

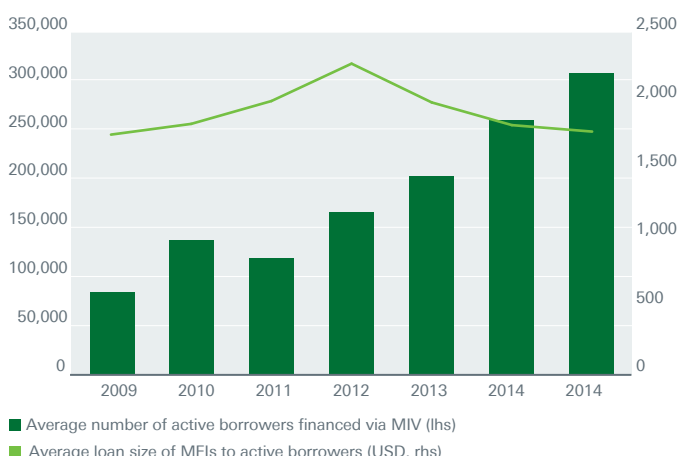
Public funders	Organisation	Tools used
Bilateral agencies	CIDA, GTZ, SIDA, SDC, DFID, USAID	Grants, guarantees, technical assistance
Multilateral agencies	AfDB, ADB, EC, IBRD, IFAD, UNCDF	Grants, guarantees, debt, equity
DFIs	AECID, BIO, CAF, FMO, EBRD, EIB, IIC, IFC, KfW	Debt, equity, grants, guarantees, technical assistance
Private funders	Organisation	Tools used
Foundations	Gates, Ford, Grameen, MasterCard, Dell	Grants, debt, equity
NGOs	ACCION, ACP, FINCA, SEPAR	Grants, debt, equity
Institutional	Pension funds, insurance companies, private equity firms	Debt, equity
Individuals	High-net-w orth, retail investors, individual donors	Debt, equity, donations, deposits

Source: Microfinance Handbook 2013 (February 2013), Deutsche Asset Management

In terms of their characteristics, MIVs can be classified as private investment funds managed by specialised investment managers. In addition, approximately 50% of all microfinance investment from DFIs, institutional investors and individuals is channelled through MIVs. As of the end of 2015, there are just over 110 MIVs investing in microfinance assets of USD 11.6 bn.

According to the 2016 Symbiotics Microfinance Investment Vehicles Survey, of the various funding sources, institutional investors remain the prime funding resource for MIVs. In terms of outreach, the average MIV reaches just over 307,000 borrowers with an average loan size of USD 1,575, **Figure 4**.

Figure 4: MIV outreach by number of borrowers and average loan size of MFIs



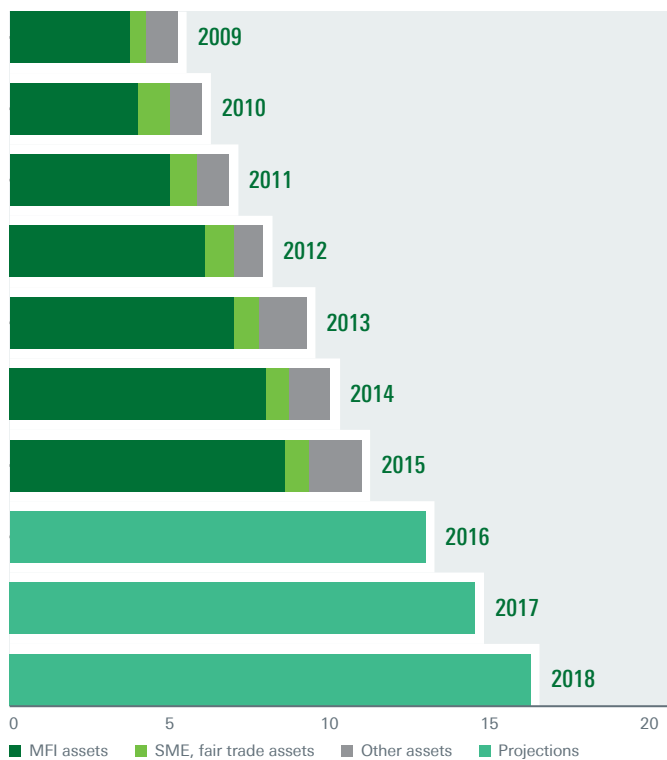
Source: 2016 Symbiotics MIV Survey (September 2016)

According to volume, around three quarters of MIVs are categorized as fixed income funds, where more than 85% of their total non-cash assets are invested in debt instruments. The remainder are split roughly equally in volume terms between mixed funds and equity funds with equity funds defined as where more than 65% of their total non-cash assets are invested in equity instruments.

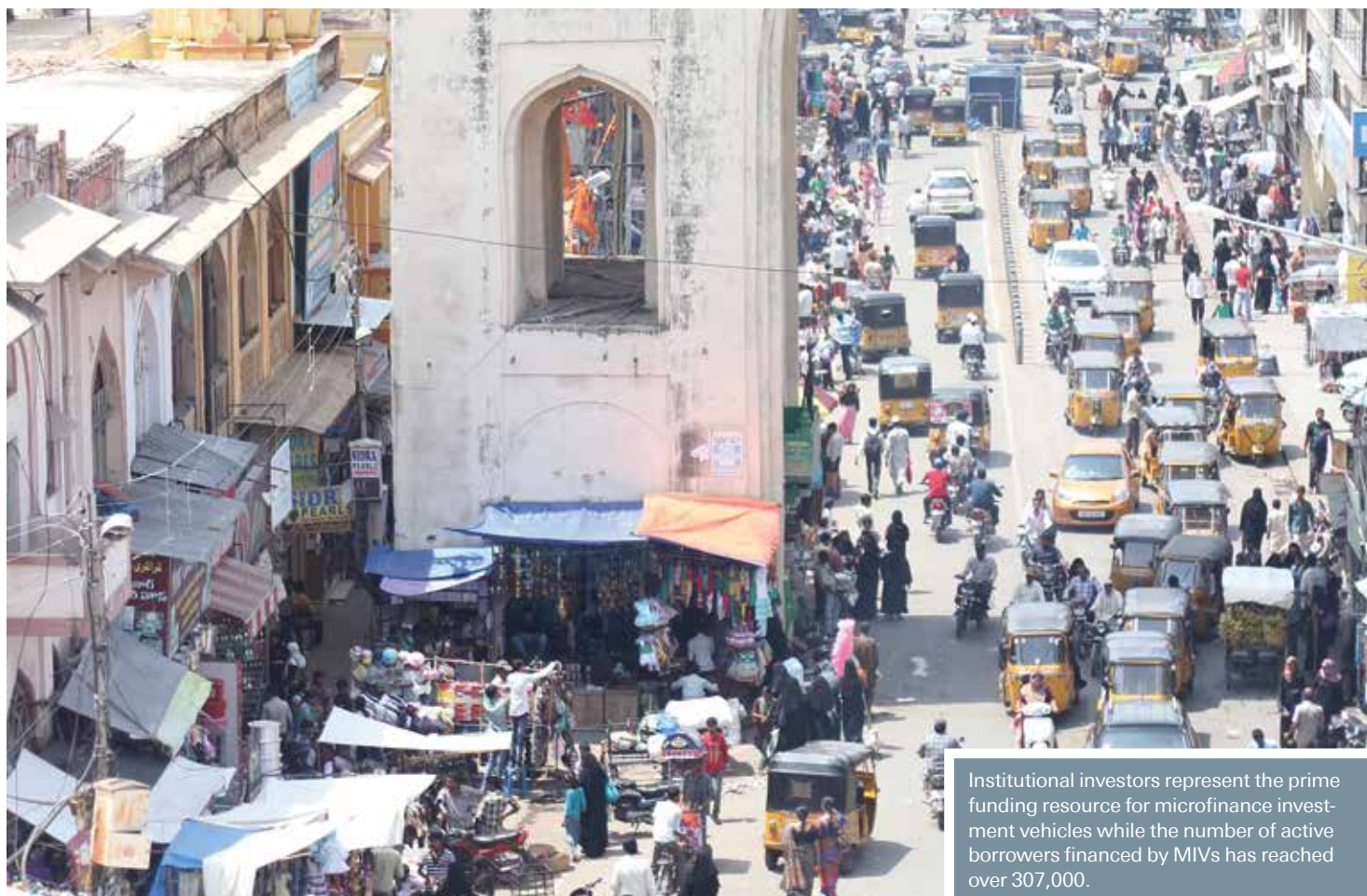
Another characteristic of MIVs is the option of either being open- or not open-ended. Since MFIs typically borrow short-term and roll over, this creates a portfolio that is comprised of stable, long-term relationships, which match the open-ended structure and typically the need of institutional investors with long-term horizons.

Over recent years, assets in MIVs have grown at an average historical growth rate of 16% while default rates are typically very low at <1%, or even <0.1% at small MIVs. Consequently if current growth levels persist MIV assets will reach over USD 16 bn by 2018, **Figure 5**. Even with this growth in the sector, we view the market as still under-supplied not least given the extent of financial exclusion.

Figure 5: Microfinance investment vehicles size and growth (USD bn)



Source: 2016 Symbiotics MIV Survey (September 2016)



Institutional investors represent the prime funding resource for microfinance investment vehicles while the number of active borrowers financed by MIVs has reached over 307,000.

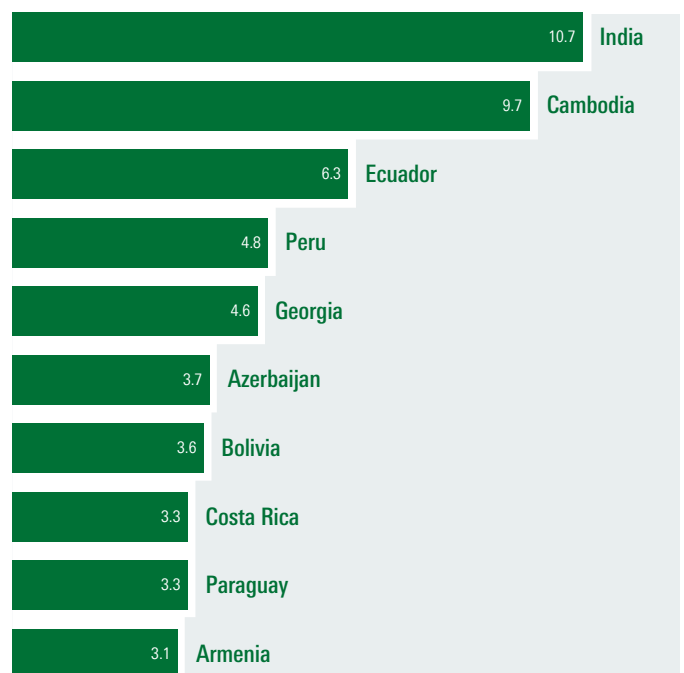
Microfinance investment vehicles have a wide regional exposure from Eastern Europe to Latin America with South Asia attracting increasingly more capital.



While the number of MIVs has increased significantly over recent years, the market remains heavily concentrated. This is highlighted in the Symbiotics 2016 Microfinance Investment Vehicles Survey, which surveyed 82% of the 113 MIVs in the marketplace with combined assets representing 95% of the market. Symbiotics data reveal that the MIVs captured in the survey are managed by 46 different asset managers located in 16 countries. However, microfinance fund managers are located primarily in three countries, Switzerland, Netherlands and Germany, with the top 3 asset managers managing 41% of the sample’s total assets.

In terms of regional activity, MIVs have the largest regional exposure to Eastern Europe & Central Asia on the one hand and Latin America and the Caribbean on the other. Compared to 2014, MIV portfolios are more balanced with South Asia attracting more capital. In terms of individual countries **India received the largest share of direct microfinance investment in 2015 followed by Cambodia and Ecuador.** Together the top 10 countries received more than half of MIVs direct microfinance investments in 2015, **Figure 6.**

Figure 6: The top 10 recipients of MIV investments in 2015



■ The destination of MIV investments by country (2015)

Source: 2016 Symbiotics MIV Survey (September 2016)

However, one of the challenges for financial inclusion across the broader economy is how to service small, medium sized enterprises (SMEs). In the developed world, SMEs are collectively the largest employers within an economy, but in the developing world are under-represented. We view the lack of access to credit as a contributory factor to the under-development of the SME sector in the developing world. According to International Finance Corporation (IFC), there exists a financing gap in this segment of the market, which is estimated to be as large as USD 2.6 tn.

3 | The risk, return and diversification properties of the microfinance sector

What started out as a means to address poverty alleviation via NGOs and cooperatives, the past decade has seen microfinance evolve into an important part of any socially responsible investment portfolio. For certain pension funds, investing in microfinance is seen as part of their Corporate Social Responsibility strategy. For others, financial considerations such as portfolio diversification dominate the motivation to be active in the microfinance sector.

In an earlier study the World Microfinance Forum Geneva examined prospects for pension fund investment in the sector. One of the obstacles has been market size and the relatively small allocations to the sector from a portfolio perspective, typically under 1%. For some pension funds such a small allocation limits the impact from an overall portfolio diversification perspective. However, we would expect as the microfinance sector grows and capacity constraints ease that this will help to increase the sector's appeal from a portfolio allocation perspective.

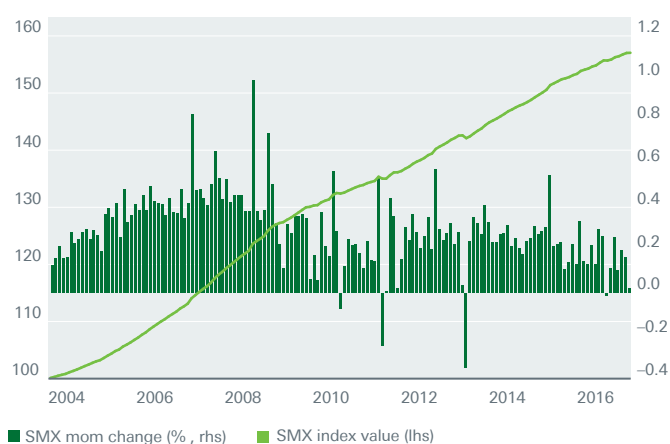
According to the Global Impact Investing Network (GIIN) and other industry surveys, institutional investors expect sustainable/impact investments to constitute 5% of their total portfolio in the next 10 years with microfinance representing an important part of these investments. However, institutional investors generally require a high degree of transparency as to the risk-return proposition of specific investments as well as comparability with competing investment alternatives. To assess these risk-return characteristics of the microfinance sector we track the Symbiotics Microfinance Index (SMX).

The SMX index has become the reference benchmark for microfinance investments. Launched in 2003, the SMX index has included a mixture of fund managers (Blue Orchard, responsibility, Symbiotics, Credit Suisse, Triodos) and MIVs (Dexia, Wallberg). Constituent funds of the SMX index all have the majority of their assets invested in microfinance debt instruments.

We find that from a returns perspective the SMX index has displayed stable and predictable returns with low volatility.

The performance of returns during the global financial crisis also reveal that the microfinance sector was more resilient to the economic downturn and from the gyrations of global financial markets than more mainstream markets such as bonds and equities. In addition, since its launch in 2003 the SMX index has only posted negative monthly returns on three occasions, or 2% of the time, and has displayed a relatively rapid recovery phase after such drawdown events, Figure 7.

Figure 7: The performance of the SMX-MIV debt USD index



Sources: Symbiotics, Bloomberg Finance LP (November 2016)

Data from the 2015 Symbiotics survey, which is based on a wider pool of MIVs such that it captures smaller MIVs, shows average net returns for fixed income MIVs averaging between 6.7% and 8.0% at their microfinance portfolio level and between 2.4% and 4.1% for investors over the 2010 and 2014 period. However, in the 2016 survey published in September last year which captured annual data for 2015, net returns for investors dropped to 1.9%, its lowest yearly return since the index's inception at the end of 2003.

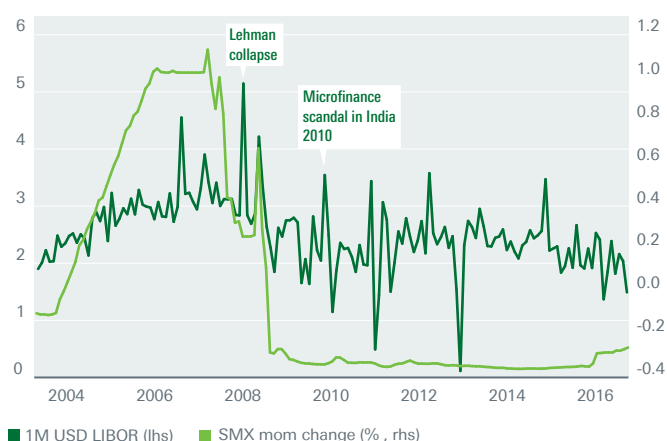
It is worth noting that the net returns for investors are after provisioning, management fees and other operational costs, which can vary substantially amongst MIVs. Generally, larger more granular MIVs may produce lower operating costs and more stable provisions over time, while management fees may depend on, for example, the investor base including retail. Symbiotics data are publically available to track the overall industry default rates for MIVs, which are very low. Write-offs averaged between 0.1% and 0.5% and overall loan loss provisions averaged between 1.0% and 3.0% over the last five years.

From a credit rating and yield perspective, we would compare MIVs to BB rated government and bank bonds, with current returns averaging 2.8% to 4.3% grouped by remaining maturity and assuming a direct investment into the portfolio of secondary market traded bonds. Note that this return would not factor in administrative and active portfolio management costs which, for a like-for-like comparison, would need to be deducted.

From a currency perspective, the expectation of a further depreciation in emerging market currencies against the U.S. dollar is a potential risk factor. In addition, many EM countries have had to contend with the significant swings in commodity prices over the past few years. Inevitably this has had an asymmetric effect on the terms of trade between commodity exporters and importers. From a regional perspective, lower commodity prices would tend to benefit most of Asia and Central America given their status as commodity importers and/or their strong trade links to the U.S.

The most significant home grown crisis to have hit the microfinance sector over the past decade has occurred in India, Figure 8. However, markets such as Nicaragua, Morocco, Bosnia, Bolivia and Pakistan have also experienced some form of credit crisis. According to a CGAP study there have typically been three common factors that have led to a crisis: (i) concentrated market competition and multiple borrowing; (ii) overstretched MFI systems and controls and (iii) an erosion of MFI lending discipline. Of the group, the events of 2010 in the Indian state of Andhra Pradesh probably sent the most shockwaves across the microfinance sector as over-borrowing and indebtedness in the province led to a broader repayment crisis in the world's largest microfinance market.

Figure 8: SMX returns, USD LIBOR and major drawdown events in the microfinance sector



As mentioned earlier, encouragingly the microfinance regulatory environment has improved over recent years with greater efficiency and transparency for private sector investors. Indeed we find that more than two-thirds of developing and

emerging markets have microfinance regulatory agents, in addition to some dedicated credit bureaus for MFIs. Furthermore, participants in the microfinance industry have rallied around a code of client protection known as the Smart Campaign, promoting an emphasis on the end client and on responsible finance. This better regulatory environment might help to explain the growth of institutional investors, which not only constitute the majority of MIV investors, but, are also the fastest growing segment among the various investment groups.

In terms of diversification, Figure 9 details the correlation of microfinance returns against benchmark fixed income, equity, commodity indices as well as money market rates over different time periods. We not only assess correlations since 2004, but, also before, during and after the global financial crisis to assess the sensitivity of sector returns in periods of extreme stress as well as to gauge how correlations have changed in a zero interest rate environment. We find that over the amend 2004-2016 period SMX returns displayed negligible or negative correlations with benchmark fixed income, equity and commodity indices.

Figure 9: SMX correlation with fixed income, equity and commodities

	DB U.S. Treasuries Overall Index	DBIQ Emerging Markets Bond Index	MSCI World Equity Index	MSCI EM Equity Index	S&P GSCI index
2006-2016	0.02	-0.10	-0.11	-0.07	0.01
Pre-crisis*	0.45	-0.12	-0.19	-0.14	0.29
During crisis	0.20	-0.45	-0.27	-0.34	-0.03
Post crisis*	-0.25	0.12	0.11	0.10	-0.01
Last 36 months	0.07	-0.37	-0.37	-0.50	-0.44
Last 12 months	0.27	-0.43	-0.53	-0.72	-0.47

* Pre-crisis ends on August 9, 2007; post crisis begins on April 2, 2009 after G20 fiscal expansion
Sources: Symbiotics, Bloomberg Finance LP, Deutsche Asset Management (Data as of September 2016)

4 | Conclusions

The microfinance sector has grown significantly over the past decade. While certain macro risks exist for the microfinance market, such as the after effects of the drop in commodity prices during 2014-2015 and the new political landscape in the U.S., we expect an acceleration in U.S. growth will be beneficial to those regions with strong economic and financial links with the U.S.. We would therefore see parts of Asia and Central America as the relative beneficiaries of these developments.

We are also witnessing the growing reach of the micro-finance sector. Not only has the range of financial services expanded to include not just microcredit, but also the provision of savings instruments, mobile payment systems and micro-insurance. The variety of funding counterparties has also increased, with institutional investors now the fastest growing segment of the investor universe.

The microfinance sector is also benefiting from a more transparent regulatory environment, which we expect will facilitate further private sector involvement. Indeed the sector's appeal has been enhanced by its low correlation to traditional asset classes, such as bonds and equities and its resilience during the financial crisis. However, the relatively small size of the microfinance sector is a constraining factor for portfolio allocation although we would expect these constraints should ease as the microfinance sector matures.

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References

- 2016 Microfinance Investment Vehicles Survey. Symbiotics, September 2016.*
- Cruz, Foster, Quillin & Schellekens 2015. Ending Extreme Poverty and Sharing Prosperity: Progress and Policies. World Bank Group PRN/15/03*
- Ends Meet: Current State and Future Prospects of European Pension Funds' Investments in Microfinance. CGAP, August 2009*
- Fenton, Adrian. Microfinance and adaptation. November 2016*
- Global Financial Development Report 2014. Financial Inclusion. World Bank Group, September 2013.*
- Global Microscope 2016: The Enabling Environment For Financial Inclusion. Economist Intelligence Unit, April-August 2015*
- International Finance Corporation (IFC) 2013 Microfinance Handbook, February 2013*
- McKinsey Global Institute 2016, How digital finance could boost growth in emerging economies, September 2016*
- Microfinance Market Outlook 2016, Developments, forecasts, trends, responsibility, January 2016.*
- The New Microfinance Handbook: A Financial Market System Perspective. World Bank Group, February 2013.*



GLOSSARY

Asset Owner Disclosure Project is an independent not-for-profit global organisation whose objective is to protect retirement savings and other long term investments from the risk posed by climate change by improving disclosure and industry best practise.

Carbon footprint is the sum of GHG emissions measured in CO2 equivalents for a specified company, product or service.

CGAP stands for the Consultative Group to Assist the Poor and is a global partnership of 34 leading organisations that seek to advance financial inclusion.

Clean technologies are aimed at reducing or eliminating environmental pollution.

Climate change is a long-term shift in the planet's weather patterns or average temperatures. Scientific research shows that the average temperature of the planet's surface has risen by 0.89C from 1901 to 2012.

CO2 refers to carbon dioxide, the most common greenhouse gas.

Corporate governance denotes the procedures and/or processes according to which an organisation is directed and controlled. Corporate governance specifies the distribution of rights and responsibilities among the different participants in an organisation such as the board, managers, shareholders and other stakeholders and lays down the rules and procedures for decision making.

Development Finance Institution (DFI) National and international development finance institutions (DFIs) are specialised development banks or subsidiaries set up to support private sector development in developing countries. They are usually majority-owned by national governments and source their capital from national or international development funds or benefit from government guarantees. This ensures their creditworthiness, which enables them to raise large amounts of money on international capital markets and provide financing on very competitive terms.

Bilateral DFIs are either independent institutions, such as the Netherlands Development Finance Company (FMO), or part of larger bilateral development banks, such as the German Investment and Development Company (DEG), which is part of the German development bank KfW. They are both among the largest DFIs worldwide. Other bilateral DFIs include OPIC, CDC and SWEDFUND.

Multilateral DFIs are the private sector arms of international financial institutions (IFIs) that have been established by more than one country, and hence are subject to international law. Their shareholders are generally national governments, but could also occasionally include other international or private institutions. These institutions finance projects in support of the private sector through mainly equity investments, long-term loans and guarantees. They usually have a greater financing capacity than bilateral development banks and also act as a forum for close co-operation among governments. The main multilateral DFIs include IFC, ADB, IDB, EIB and EBRD.

Divestment programmes are the withdrawing or withholding of financial capital at an industry, sector or country level.

Ethical investment is an investment philosophy guided by moral values, ethical codes or religious beliefs. Investment decisions therefore include non-economic criteria and typically are associated with negative (or exclusionary) screening.

ESG refers to Environmental, Social and Corporate Governance and has emerged as the term to describe the issues that investors are considering in the context of corporate behaviour. No definitive list of ESG factors exists but they typically display one or more of the following characteristics: (i) issues that have traditionally been considered non-financial or not material; (ii) a medium or long-term time horizon; (iii) qualitative objectives that are not readily quantifiable in monetary terms; (iv) externalities not well captured by market mechanisms; (v) a changing regulatory or policy framework; (vi) patterns arising throughout a company's supply chain; and (vii) a public-concern focus.

ESG integration the systematic and explicit inclusion by investment managers of ESG risks and opportunities into security analysis, valuation and investment decision

ESG risks refer to Environmental, Social and Corporate Governance issues that may have a negative impact on the security analysis, valuation and investment decision. Some of those ESG themes that can have a meaningful impact on financial returns are climate change, resource scarcity, labor rights and corporate governance

Fiduciary duties emerge from business-relationships in which one party (asset manager) is entrusted with managing the assets/money of another party (client). The most important fiduciary duties are to act in the best interest of the client, to avoid any conflicts of interest (duty of loyalty) and to act with due care, skill and diligence (duty of prudence).

Financial inclusion is the proportion of individuals and firms that use formal financial services. It is therefore different to access to finance since some people may have access, but, choose not to use financial services.

Greenhouse gases (GHG) are gases, such as carbon dioxide, methane and nitrous oxide, that allow sunlight to enter the atmosphere freely, but when sunlight strikes the Earth's surface, some of these gases are reflected back towards space as infrared radiation (heat) which greenhouse gases absorb.

Impact investing refers to investments made into companies, organisations and funds, often in private markets, with the intention to generate a measurable, beneficial social or environmental impact alongside a financial return.

Infrastructure assets consist of physical structures and essential services that facilitate in the efficient working of an economy. Examples of infrastructure assets include airports, rail and toll roads on the one hand and water, power generation and electricity transmission and distribution on the other.

Maya Declaration is a commitment to unlock the economic and social potential of the 2.5 bn unbanked individuals worldwide through increased financial inclusion. Signatories to the Maya Declaration agree to make measurable commitments to increase financial inclusion through the creation of an enabling environment to harness new technology that increases access and lowers the cost of financial services; by implementing a framework that achieves the complimentary goals of financial inclusion and financial stability; by integrating consumer protection and financial literacy as key pillars of financial inclusion and lastly by collecting and utilising data to promote evidence-based policymaking and measurable progress in monitoring and evaluation.

Microcredit is the provision of small loans to low income entrepreneurs.

Microfinance is the provision of financial services to low-income households and small informal businesses. The microfinance sector has grown from solely focusing on microcredit, that is small loans to low income entrepreneurs, to now include the provision of savings instruments, payment systems and specifically electronic cash and micro-insurance.

Microfinance institution (MFI) is a financial institution specialising in banking services for low-income groups and individuals. A MFI provides account services to small-balance accounts that would not normally be accepted by traditional banks. MFIs include banks, regulated nonbank financial institutions, savings and loan cooperatives and not-for-profit organisations.

Microfinance investment vehicles (MIVs) are independent investment entities that specialise in microfinance, with more than 50% of their noncash assets invested in microfinance. They are either self-managed or managed by an investment management form and are open to multiple investors. MIVs may issue shares, notes, or other financial instruments. MIVs can be classified according to their financial instruments, legal forms and distribution (public or private placements).

Montreal Carbon Pledge commits signatories to measure and publicly disclose the carbon footprint of their investment portfolios on an annual basis

Negative/exclusionary screening is the exclusion from a fund or plan of certain sectors or companies involved in activities or industries deemed unacceptable or controversial.

Norms-based screening is the screening of investments against minimum standards of business practice based on international norms.

Positive/best-in-class screening is the investment in sectors, companies or projects selected for positive ESG performance relative to industry peers. This typically involves positive or negative screening or portfolio tilting.

Proxy voting enables investors to execute their voting rights by entrusting a third party (e.g. proxy advisors) and enabling them to carry out the votes as instructed and according to an applicable guidance (e.g. Proxy Voting Guidelines). Therefore, it is not necessary for the investor to be actively present and vote at shareholder meetings (AGM).

Renewable energy is defined as energy that comes from a source that is not depleted when used, such as wind or solar power.

Responsible investment is an investment strategy which seeks to generate both financial and sustainable value. It consists of a set of investment approaches that integrate environmental, social, governance (ESG) and ethical issues into financial analysis and investment decision-making

Shareholder engagement is the practice of monitoring corporate behavior and seeking changes where appropriate through dialogue with companies or through the use of share ownership rights, such as filing shareholder resolutions. Shareholder engagement activities include engaging with companies on matters such as strategy, performance, risk, capital structure, and corporate governance, including culture and remuneration. Furthermore, it is often employed in attempts to improve company's ESG performance and transparency.

Small, medium-size enterprises (SMEs) are defined by three keywords – small, single and local. SMEs are small in terms of number of employees ranging from 10 persons (small) to up to 200 (medium) depending on the country's laws. SMEs also have limited working capital and assets and turnover. Most SMEs have a single owner and typically the SME produces just a single product or service provided. The market for the SME is usually localised to the area where they are located.

Stewardship can be defined in general terms as the responsible management of something entrusted to one's care. This suggests a fiduciary duty of care on the part of those agents entrusted with management responsibility to act on behalf of the end beneficiaries. In an investment context institutional investors are the agents acting on behalf of beneficiaries, who are often long-term savers or members of pension funds. At an individual company level stewardship helps to promote high standards of corporate governance which contributes to sustainable value creation, thereby increasing the long-term risk adjusted rate of return to investors and their beneficiaries or clients. At an investor level, stewardship is about preserving and enhancing long-term value as part of a responsible investment approach. This includes the consideration of wider ethical, environmental and social factors as core components of fiduciary duty. In a broader context, stewardship enhances overall financial market stability and economic growth.

Sustainable Development Goals (SDGs) are official known as Transforming our world: the 2030 Agenda for Sustainable Development, and are an intergovernmental set of 17 aspirational goals with 169 targets covering a broad range of sustainable development issues. Goals cover ending poverty and hunger, improving health and education, making cities more sustainable, combating climate change, and protecting oceans and forests. The Goals are contained in paragraph 51 United Nations Resolution A/RES/70/1 of 25 September 2015.

The United Nations-supported **Principles for Responsible Investment Initiative** was launched in 2006 and is an international network of investors working together to put the six Principles for Responsible Investment into practise. Its goal is to understand the implications of sustainability for investors and support signatories to incorporate these issues into their investment decision marketing and ownership practises. In implementing the Principles, signatories contribute to the development of a more sustainable global financial system.

Sustainable investment is a form of investing which companies investors' financial objectives with their concerns about environmental, social, ethical and corporate governance issues. In some instances this is also referred to as socially responsible or ethical investing.

Sustainability or sustainable development refers to the concept of meeting present needs without compromising the ability of future generations to meet their needs. It encompasses social welfare, protection of the environment, efficient use of natural resources and economic well-being.

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