

The Risks and Opportunities
of Climate Change

CLIMATE CHANGE RELATED REGULATION

Part 2
[Period/Date]

Key Points:

In response to increasing legislation and policy, major economies have started regulating carbon and energy using a variety of approaches. Pg. 2

Companies are responding to increased climate related regulation by introducing measures such as internal carbon pricing. Pg. 4

Regulatory risks associated with climate change will have differing implications for investors depending on factors including investment approach, asset class and time horizons. Pg. 5

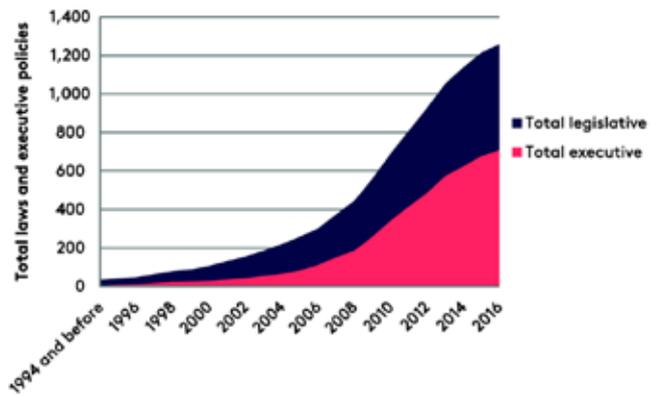
Overview

Following on from our first paper on the physical impacts of climate change, part two in our five part series focuses on the regulatory risks associated with carbon emissions and related policies like efforts to reduce air pollution.

Legislation and other policy measures to curb emissions are being introduced around the world to curb emissions and have accelerated in recent years. Since 1997, there has been a 20x increase in the number of climate change laws and policies. By the end of 2017, there were over 1,200 climate change laws and policies across 140 countries¹, at global, national, state, local and sectoral levels.

The Paris Agreement in December 2015 was a significant milestone as it established clear objectives and a legally binding framework for addressing climate change for all countries. The objective of the agreement is to hold the increase in the global average temperature to well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels.

Chart 1: Total climate change laws and policies



Source: Climate Change Laws of the World, Grantham Research Institute 2017.

As part of the agreement, 195 countries have made commitments (Intended Nationally Determined Contributions or INDCs) to limit their greenhouse gas emissions and assist developing countries with the transition to a low carbon economy and to manage the physical impacts of a changing climate.

The commitments made to date and a five year review framework (designed to increase ambition over time), will drive the increasing coverage and scope of climate change regulation to meet individual countries' INDCs. Chart 2 shows countries (in green) who have targets with examples from key countries.

Chart 2: Examples of country pledges to reduce emissions after 2020



Source: BlackRock and Bloomberg New Energy Finance, 2015.

¹ Source: CarbonBrief: <https://www.carbonbrief.org/mapped-climate-change-laws-around-world>

Forms of domestic regulation

Most major economies have started regulating carbon and related issues like air pollution. A number of approaches have been undertaken with mixed success. Policy responses include:

1. Carbon pricing (emissions trading or direct taxes)
2. Emissions standards (carbon and other related pollutants e.g. mercury, particulate matter etc)
3. Energy efficiency and renewable energy incentives (renewable energy targets, feed-in tariffs, direct subsidies)
4. Forest and farming programs
5. Other initiatives including removal of fossil fuel subsidies, disclosure requirements and changes to approval processes

Carbon regulation has seen significant advancements globally. Countries who are not providing investment and business certainty through low-carbon regulatory frameworks may be placing their domestic businesses and economies at a competitive disadvantage by perpetuating regulatory uncertainty.

Carbon pricing, emissions standards, energy efficiency and renewable energy incentives are directly relevant to most companies and the main subject of this paper. However, forest and farming and the removal of fossil fuel subsidies also have the potential for significant sector specific impacts.

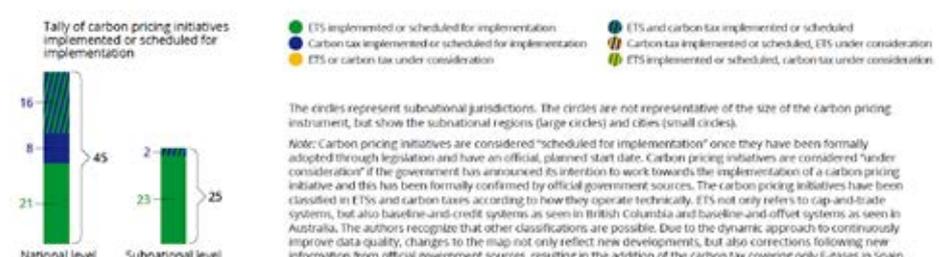
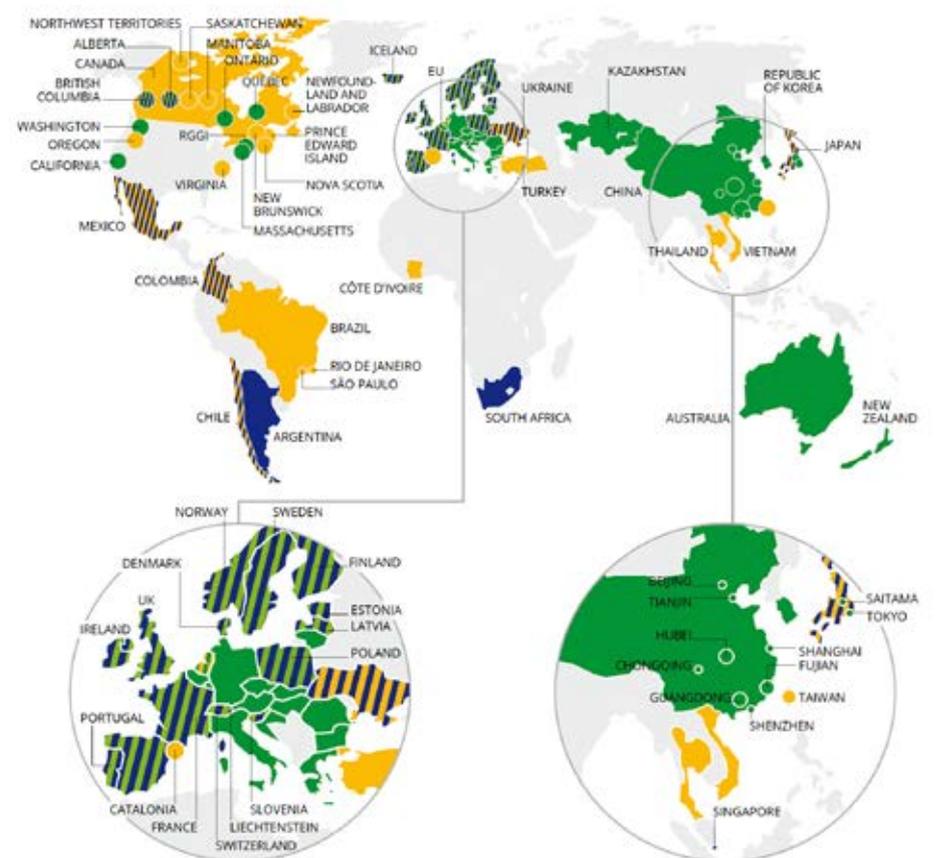
1. Carbon Pricing

Carbon pricing, a market based mechanism, is the most widely discussed and promoted regulatory approach to addressing climate change, often in combination with energy efficiency standards and/or renewable energy targets. Carbon pricing has been increasingly adopted by countries since the EU scheme was established in 2005 as it's generally considered the most efficient, scalable and transparent regulatory approach.

In 2018 45 countries and more than 25 cities/states have implemented an emissions trading scheme or a carbon tax using prices ranging from under US\$1 per tonne of CO₂e to US\$140 a tonne. While prices are not necessarily comparable between carbon pricing initiatives (because of differences in the sectors covered and allocation methods applied), these programs were valued at US\$82bn (up 56% from 2017) and cover 20% of global GHG emissions². Chart 3 shows the countries and types of initiatives implemented while Chart 4 shows the percentage of global emissions covered over time.

There are various issues with the implementation of trading schemes as well as the maintenance of effective prices. For example in the EU scheme, the over allocation of permits in the face of slowing economies following the global financial and European debt crises resulted in extended periods of depressed carbon prices. Lessons from these issues are increasingly being learnt as new schemes are implemented. For example, China introduced regional pilot programs in 2013 to test the framework and build confidence in the market ahead of a national scheme to be launched by 2020.

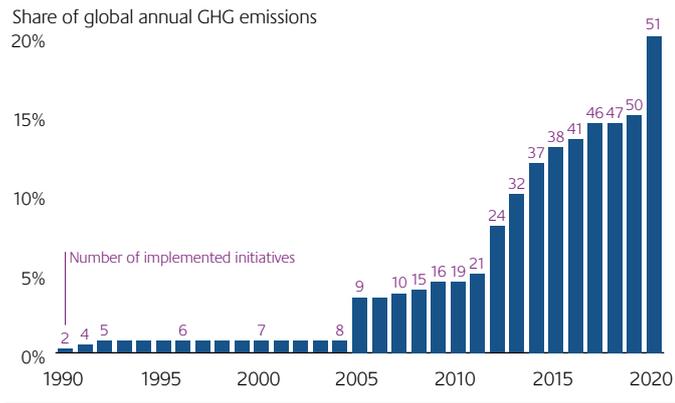
Chart 3: Countries/states with carbon pricing mechanisms



The circles represent subnational jurisdictions. The circles are not representative of the size of the carbon pricing instrument, but show the subnational regions (large circles) and cities (small circles).
 Note: Carbon pricing initiatives are considered "scheduled for implementation" once they have been formally adopted through legislation and have an official, planned start date. Carbon pricing initiatives are considered "under consideration" if the government has announced its intention to work towards the implementation of a carbon pricing initiative and this has been formally confirmed by official government sources. The carbon pricing initiatives have been classified in ETSs and carbon taxes according to how they operate technically. ETS not only refers to cap-and-trade systems, but also baseline-and-credit systems as seen in British Columbia and baseline-and-offset systems as seen in Australia. The authors recognize that other classifications are possible. Due to the dynamic approach to continuously improve data quality, changes to the map not only reflect new developments, but also corrections following new information from official government sources, resulting in the addition of the carbon tax covering only F-gases in Spain.

Source: Ecofys/Worldbank 2017.

Chart 4: Number of carbon pricing initiatives (Globally)



Source: Ecofys/Worldbank 2017.

2. Emissions standards and energy efficiency measures

Energy efficiency standards are sometimes legislated but often include government led or supported programs. These programs aim to increase disclosure, standards and changes to procurement practices to drive change in the market. Green building and appliance ratings are examples of these. Charts five and six show the countries and states who have implemented emission standards and energy efficiency programs.

Chart 5: Countries/States with emissions standards



Source: The Climate Institute, 2017.

Chart 6: Countries/States with energy efficiency programs



Source: The Climate Institute, 2017.

Emission standards mostly target transport and stationary energy while energy efficiency standards mostly relate to buildings, industry, appliances and lighting. The UK, Canada, the US and China have all introduced emissions performance standards for new power generation facilities. These standards are driving technological development and fuel switching across markets. They have also forced the closure of generators which are too expensive to upgrade.

In 2014, Chinese Premier Li Keqiang said the government would “declare war” on pollution in his speech to the National People’s Congress. China’s 13th Five-Year Plan includes hard targets for specific pollutants as well as for overall ambient air quality improvements. To control carbon emissions, China has promised to peak carbon emissions by 2030 and has also set a cap on energy consumption, at five billion tonnes of coal equivalent in 2020.

Coal consumption in China peaked in 2013 and has since been falling (on average) in part due to the introduction of pollution control measures which restrict steel and aluminium production in the winter. In 2015 China’s state planner banned the burning of coal with ash content of more than 16 per cent or sulphur content of more than 1 per cent. This was part of an effort to fight air pollution in populous and prosperous eastern cities.

In May 2017, Indian Prime Minister Narendra Modi also introduced a number of initiatives to be achieved by 2030 including reducing energy emissions intensity by 30-35%.

Transport is another important area for emissions standards given it represents 23% of global emissions growing at 2.5% per annum.¹ Over 70% of light vehicles sold globally in 2014 were subject to emissions standards.²

Schemes like these can pose both regulatory and stranded asset risks depending on the capital intensity and life-cycle of a manufacturer’s asset base.

Emissions standards and the risks of non-compliance came to international attention with the Volkswagen emissions scandal where the company installed software designed to defeat emission tests. Reports have estimated the cost of the scandal to Volkswagen could reach US\$35bn.³

The aviation industry is also subject to national emissions standards as well as a new scheme introduced by the International Civil Aviation Organization (ICAO). The new Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) aims to keep CO2 emissions from international aviation rising after 2020.

3. Renewable energy incentives and targets

Encouraging greater renewable energy deployment is a key policy tool in many countries for reducing emissions. Chart 7 (over page) shows the global growth in renewable energy incentives between 2004 and 2017 with a range of measures including targets, feed-in tariffs, direct tenders and mandates.

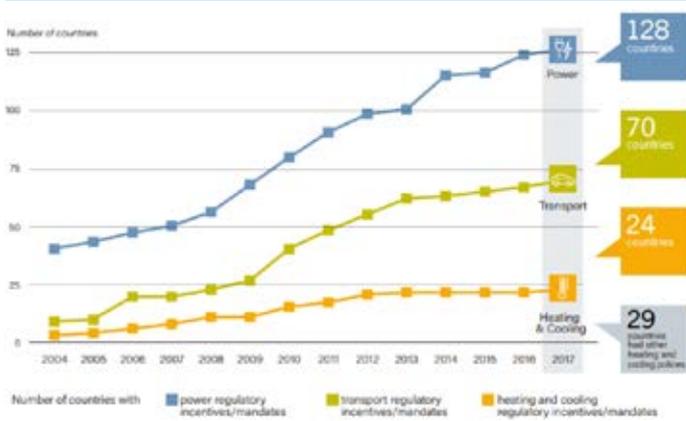
While incentives have been critical in growing the penetration of renewable energy technologies, falling costs have seen wind and solar become competitive with traditional high carbon energy sources. Renewable installations have been greater than new fossil fuel installations since 2013 with 2015 being the first year where over half of new installations were renewable (Chart 8 – over page).

¹ Source: IEA.

² Source: Climate Change Authority (Aust).

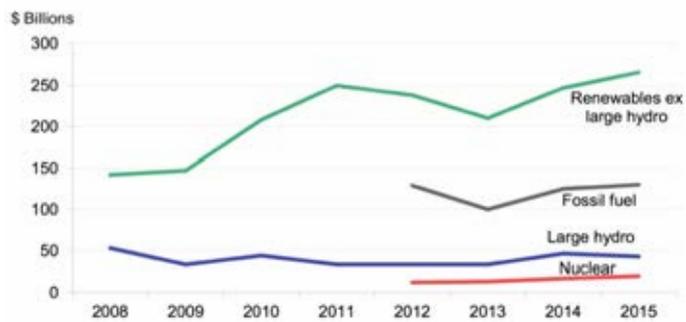
³ Source: <http://fortune.com/2018/09/08/volkswagen-vw-diesel-scandal/>.

Chart 7: Growth in renewable energy incentives.



Source: REN21 Policy Database 2017.

Chart 8: New power capacity investments 2008 – 2015



Source: Bloomberg New Energy Finance 2017.

While popular and broadly successful, sudden changes in regulation, particular for feed-in tariffs¹ have caused some market uncertainty. Spain was one of the worst examples where retrospective changes to overly-generous feed-in tariffs in 2013 caused significant losses to existing investors while creating a sovereign risk for future investment. Germany saw a more successful scheme with its transparent and progressive decline in feed-in tariffs causing renewable energy investment to grow strongly in the country.

Another successful method for accelerating the deployment of renewable energy has been reverse auctions arranged by governments including India, Mexico, Brazil and China. In 2018 India announced it plans to tender for 50GW of renewable energy as part of its target to have 40% of electricity from non-fossil fuel sources by 2030.

Company responses to increased climate related regulations

Regulatory initiatives, like the examples above, are impacting operating costs, capital plans and the cost of capital across the value chain in a number of sectors and consequently impacting asset values. These changes have been particularly prominent for energy related companies although other sectors are also affected. Regulatory risk can potentially impact organisations at three points.

- Emissions from the company's own operations (Scope 1 emissions),
- Indirect emissions from the company's use of energy and heat (Scope 2 emissions),
- Emissions linked to other key inputs or the use of the company's goods and services (Scope 3 emissions).

Companies generally focus on communicating their direct liability to carbon emissions regulation, including their own emissions and the net cost of carbon permits they are required to hold under emissions trading schemes. These costs are important and are likely to grow over time, however many companies do not provide adequate information

on the risks of carbon liabilities being passed down the supply chain or changing end demand for products and services. These issues will be covered under transition and stranded asset risks in the next paper in this series.

Climate and carbon risks affect sectors to varying degrees. Energy, materials, some industrial and utility companies have the highest direct carbon intensity and therefore the largest regulatory exposure to emissions compliance schemes. The property and financial services sectors are also exposed to these risks due to the life cycle emissions of buildings and the potential for changing credit risk and asset values in the lending and investment portfolios of financial institutions.

These issues also present significant opportunities for companies providing solutions from clean technology and more energy efficient products along with competitive advantages for companies who are early movers or provide complimentary products and services.

Internal carbon pricing

According to the Centre for Climate and Energy Solutions, companies are increasingly setting an internal carbon price in anticipation of regulation as a way to manage risk. This is being used in a range of ways including:

- risk assessment in scenario planning,
- applying higher hurdle rates for capital investment decisions,
- assisting the business case for emissions or energy reduction measures,
- helping support the business case for low-carbon products and services.

Internal carbon pricing generally takes one of three forms.

- An internal carbon fee as a monetary value on each ton of carbon emissions may be applied throughout an organisation. The fee creates a dedicated cost/revenue stream to fund the company's emissions reduction efforts. This has been observed to sit between US\$5-\$20 per metric ton CO₂e.
- A shadow price as a theoretical price on carbon to support long-term business planning and investment strategies. The observed price range for companies using a shadow price is from \$2-\$893 per ton CO₂e. Most companies use a shadow price higher than current regulatory levels.
- An implicit price as a cost to reflect how much a company spends to reduce greenhouse gas emissions and/or cost of complying with government regulations. For example, it can be the amount a company spends on renewable energy purchases or compliance with fuel economy standards. It helps companies identify and minimise these costs, and uses the information gained from this to understand their own carbon footprint. For some companies, an implicit carbon price can set a benchmark before formally launching an internal carbon pricing program.

Embedding a carbon price into business strategy

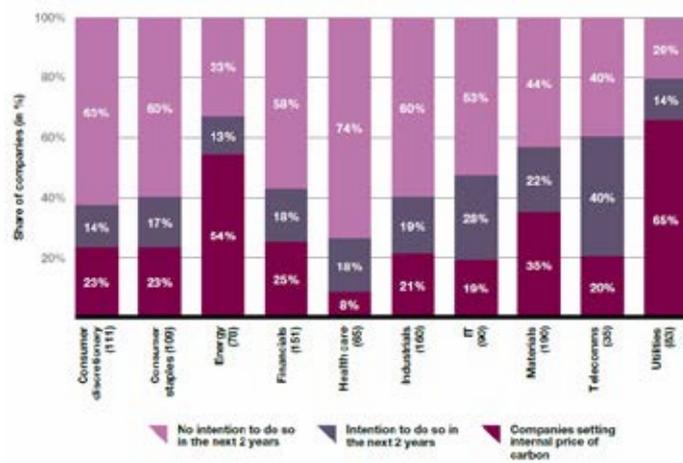
Key findings of a 2016 report by CDP² provides insights into the growing yet still wide variability ways companies are responding to carbon pricing signals. This highlights the importance for investors to fully understand how these initiatives are impacting (or not) capital allocation decisions.

¹ A feed-in tariff is a premium rate paid for electricity fed back into the electricity grid from a designated renewable electricity generation source.

² CDP was formerly called Carbon Disclosure Project.

- While 370 companies in 14 high-emitting industries say they are adopting carbon pricing, over 500 say they do not plan to do so. Approximately 400 of these are headquartered in countries who are considering, are currently implementing or already have a price on carbon. The number of companies potentially at risk is likely to be even larger given the multinational nature of many of these companies and the wider sectoral coverage of some carbon taxes.
- 23 per cent more companies disclosed either their practice of internal pricing carbon, or plans to do so, than in 2015.
- There is an increase in corporate carbon pricing, notably in Brazil, China, India, Japan, Mexico, Republic of Korea and the US.
- Companies using an internal carbon price are seeing tangible impacts such as shifting investments to energy efficiency measures, low-carbon initiatives, energy purchases and the development of low-carbon product offerings.
- Although largely undisclosed, internal carbon price levels vary by region from less than \$1 to more than \$800.
- Internal carbon pricing was greatest amongst utilities and energy sector companies.

Chart 9: Companies setting an internal price of carbon by sector.



Note: The total number of companies that responded to the survey is shown in parentheses for each sector.
Source: CDP, 2016.

In the annual CDP survey in 2017, 57 per cent of respondents currently use internal carbon pricing, and 3 per cent of those have also committed to the UN Global Compact’s Business Leadership Criteria on Carbon Pricing and/or the World Bank’s Statement on Putting a Price on Carbon.

Investment implications

Various factors will influence the ability to account for and act on the regulatory risks associated with climate change. These include the investment approach (e.g. active vs passive, growth vs quality etc), asset class and time horizon of the investor.

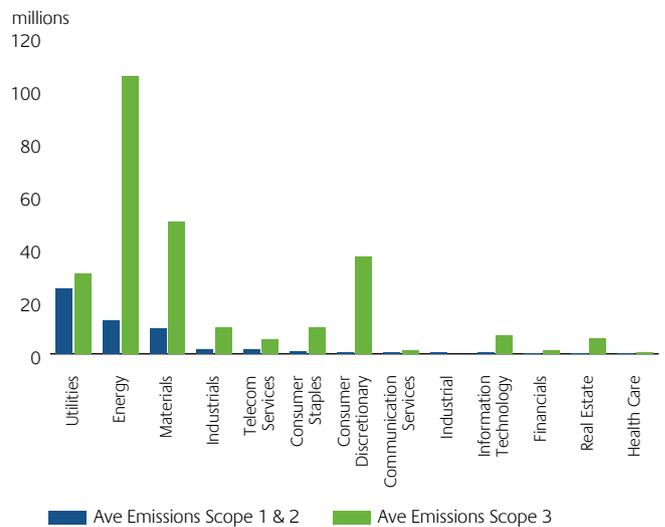
The risks associated with the regulation of emissions are more straight-forward to factor in by investors in their investment analysis than physical risks but is not without challenges.

Investors can also use their influence with companies to encourage and then measure the progress of efforts to rapidly reduce emissions. Given the serious risks posed by climate breakdown highlighted in our first paper, action by companies and investors will be important contributions in the global effort to keep temperature increases well-below 2°C.

Chart 10 shows the average emissions by sector for scope 1 and 2 emissions. These are normally included in footprint analysis and directly attributable to the firm. The chart also shows scope 3 emissions which are indirect and not consistently or comprehensively reported. While

the chart shows that four sectors contribute the vast majority of direct emissions, scope 3 emissions will be more relevant for some sectors and so should be considered when formulating carbon aware strategies.

Chart 10: Average Carbon Emissions by Sector



Source: MSCI/CFSGAM.

Investors can employ various strategies to manage regulatory risks including:

1. Incorporation of carbon costs for individual assets or companies.

While on the surface incorporating a carbon cost into valuation models is relatively straight-forward, an understanding of market dynamics and a company’s ability to pass through costs or reduce emissions should be considered. In addition other regulatory interventions for related issues like air pollution should also be considered. For some companies regulation around carbon and other pollutants may put them at a relative advantage, particularly those who have acted early to reduce emissions or whose business model allows them to benefit from regulatory tailwinds.

2. Assumptions related to other capital/operating expenditure

A critical risk for investors is how companies decide to invest capital and the life cycle of carbon intensive capital assets. While transition risks and stranded assets are covered in the next paper in this series, changing carbon regulations can accelerate these risks.

For example, early closures of coal-fired power generators to avoid the cost of upgrades when pollution standards change can dramatically shift the financial position of some companies. Additional costs associated with early closures like a lack of balance sheet recognition for site remediation should also be considered.

Conversely many companies can achieve significant savings through energy efficiency and investment in lower cost clean energy alternatives.

3. Assessing supply chain risks

Some companies will be better able to pass on the costs of carbon regulation than others. Understanding whether a company or an asset is likely to have costs passed on to it or is able to pass costs on is a normal dimension of supply chain analysis which can be extended to carbon regulations, albeit with some important differences. These considerations are covered in more details in the following paper on transition and stranded asset risks.

4. Portfolio construction

In addition to incorporating carbon regulation into company analysis and valuations, some investment strategies now incorporate specific emission reduction targets. For example, smart beta strategies have been developed which reduce carbon exposure while aiming to maintain overall portfolio risk and return characteristics.

These carbon reduction strategies have increased in popularity in recent years because they provide an explicit and measurable reduction at the portfolio level in a risk aware and cost efficient manner. This measurability allows for rigorous ongoing monitoring of portfolios against the reduction targets.

However care must be taken, whether through smart beta or any other strategy with explicit carbon footprint reduction targets.

One issue is that around half of companies globally do not disclose emissions and so are estimated by third party providers based on industry averages which lifts some companies while dragging others down. This underlies the importance of engagement on initiatives such as the Taskforce for Climate-Related Financial Disclosure (TCFD) and CDP to continue to improve company disclosure.

A singular focus on emission reductions also risks missing and in some cases unintentionally increasing exposures to other climate change risks like stranded asset risks. For example some approaches will invest in pipelines and mining services companies rather than oil and gas companies in an effort to maintain energy exposure with lower emissions even though these companies may have less flexible business models. Similarly some electric utilities may be excluded for higher emissions when they are often best placed to transition to a low carbon economy.

The increasing number of green bonds and other targeted investments also offer opportunities for investors in both mainstream and dedicated portfolios to allocate capital to the low carbon transition. A green label does not guarantee 'greenness' however and so investors should consider how use of proceeds is managed, how any capital this frees up is to be deployed, what ongoing reporting is to be provided by issuers and what third party assurance (to frameworks like the Climate Bonds Initiative) have been performed.

While returns for green bonds have generally been in line with 'non-green' bonds, by including the regulatory tailwinds for low carbon assets and the need to mitigate physical climate change risks, investors may consider these assets to be lower risk and consequently more attractive on a risk return basis than non-green alternatives.

Other asset classes from listed equities to unlisted assets also offer opportunities for targeted investments which are aligned with achieving emission reductions. These targeted investments can be made as part of a strategy which reduces exposure to higher carbon investments.

5. Engagement with company management and boards

As with all aspects of climate change risk and opportunity, engagement with companies is a critical area of work for investors. Collaborative initiatives such as the Climate Action 100+ along with individual engagement efforts offer important opportunities for investors to better understand the issues and encourage improved performance from companies.

Encouraging disclosure in line with the TCFD, which covers, governance, strategy, risk management and metrics and targets, is a good starting point for ensuring appropriate systems are in place.

Given the urgency of the emissions reduction challenge, asking companies to set science based reduction targets as part of a transition plan and monitoring their performance against those will set a clear baseline for ongoing engagement.

Proxy voting for listed equities is also an important engagement tool given the increasing number of shareholder resolutions being put to company general meetings requesting improved disclosure and other actions related to climate change.

Investors might wish to question the suitability of directors who are on the record as dismissing or denying climate change. Not "believing" in climate change does not absolve a director from their duty to show due care and diligence in managing the risks. Risks related to director duties is covered in the fourth paper in this series.

6. Advocacy and engagement with regulators and other stakeholders

With all aspects of climate change risk and opportunity, investor advocacy with regulators and other stakeholders is important for developing a comprehensive climate change strategy.

Policies which are transparent, long-term, consistent and scalable, like carbon pricing, make incorporation of carbon risks easier for investors. Similarly, policy vacuums or repeated changes to policy frameworks increase uncertainty and risk which discourages investment or increases the return demands of investors to compensate.

7. Climate change governance and risk disclosure (inc voting)

Investor governance and disclosure of these issues is important for providing information to clients and key stakeholders, but also for sending a signal to the market. The TCFD has specific guidance for asset owner and asset manager disclosure.

The table below outlines these different approaches for managing the physical risks across asset classes with further description provided.

Asset Class	Incorporation of physical risks in assessing individual or groups of assets	Assumptions related to capital/operating expenditure	Assumptions related to demand for goods and services	Engagement with company management	Advocacy and engagement with regulators and other stakeholders	Climate change governance and risk disclosure (inc voting)	Adaptation planning	Assessing supply chain risks	Adaptation finance
Active Domestic Listed Equities	X	X	X	X	X	X		X	
Active Global Equities	X	X	X	X	X	X		X	
Passive Domestic Listed Equities	X			X	X	X			
Passive International equities	X			X	X	X			
Corporate debt	X	X	X	X	X	X		X	X
Corporate debt financials				X	X	X		X	X
Sov/semi/supra Debt	X	X	X		X	X		X	X
Private equity	X	X	X	X	X	X	X	X	X
Unlisted property	X	X	X	X	X	X	X	X	X
Unlisted Infrastructure	X	X	X	X	X	X	X	X	X

High Level – external tools and forecasts

Medium Level – external tools and forecasts, proprietary models/frameworks

Deep level – external tools and forecasts, proprietary models/frameworks, specialist reports and advice

Conclusion

Carbon and related pollution regulation has taken various forms around the world and has grown significantly in the last several years. Commitments made under the Paris Climate Change Agreement are likely to accelerate the adoption and ambition of policy measures being deployed.

Compared to physical risks, investors have a much greater ability to incorporate carbon and related pollution regulations into company analysis and valuations, portfolio construction and engagement. However it's important to note, the urgency of reducing emissions cannot be divorced from the physical risks of climate change.

While the range of policy measures impacts some industries more than others, knock on effects and the ability (or not) for companies to pass on costs should also be considered when assessing the risks and opportunities associated with these regulations. The TCFD provides a solid framework for both investors and companies to test these approaches

Good governance, transparency and positive advocacy around climate change regulation are as important for investors as they are for the companies invested in.

Coming next, Part 3

In the next paper in this series we will cover transition and stranded asset risks which come from the complex mix of physical, carbon and other factors like technological change and consumer preferences, which are shifting the prospects for companies and is disrupting whole industries.

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