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Climate change: the forgotten physical risks

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Most climate analysis focuses on the impacts of steps to limit temperature rises, such as carbon prices or clean energy investment. Physical risks, on the other hand, have received less attention. That oversight is remiss; the impacts are lower, but they are also more certain. Physical damage lags atmospheric CO_2 concentrations, which have been rising for decades, and will drive greater disruption even if emissions fall now. Our analysis examines the implications for companies and investments.

Over the last year, we have invested heavily in developing tools to help our analysts, fund managers and clients better understand the threat climate change poses. No single measure can capture the breadth of climate impacts, but combined they provide a rounded view of the challenge ahead. We have described our analysis of the investment implications of these impacts in previous research, concluding that up to 20% of the value of global listed companies could be exposed to climate risks[1].

Physical costs are rising

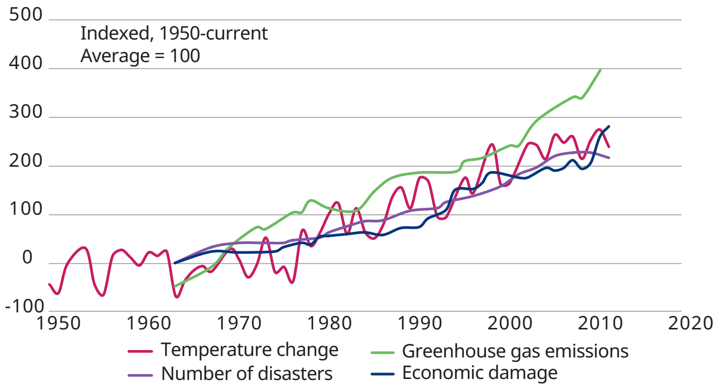
The science linking levels of greenhouse gases (GHGs) in the atmosphere with global temperatures and, as a result, more volatile and damaging weather patterns, is clear. Temperature rises lag increases in GHG concentrations in the atmosphere by around 40 years, meaning that even if emissions stopped tomorrow, the earth's average temperature would likely rise by a further 0.6 degrees[2]. Further disruption from the effects of changing weather patterns therefore looks unavoidable, meaning bigger risks to physical assets and infrastructure. Figure 1 graphically illustrates the close correlation between temperature rises and that disruption.

Figure 2 plots Munich Re's estimate of the annual costs associated with climate damage. Both the level and uncertainty of climate costs have risen over recent decades. We believe larger impacts are very likely in the future.

Quantifying the extent to which individual companies and portfolios are exposed to physical climate risks is an important element of preparing for a more challenging future.

1 www.schroders.com/en/lu/professional-investor/features/climate-change-dashboard
2 https://earthobservatory.nasa.gov/blogs/climateqa/would-gw-stop-with-greenhouse-gases/

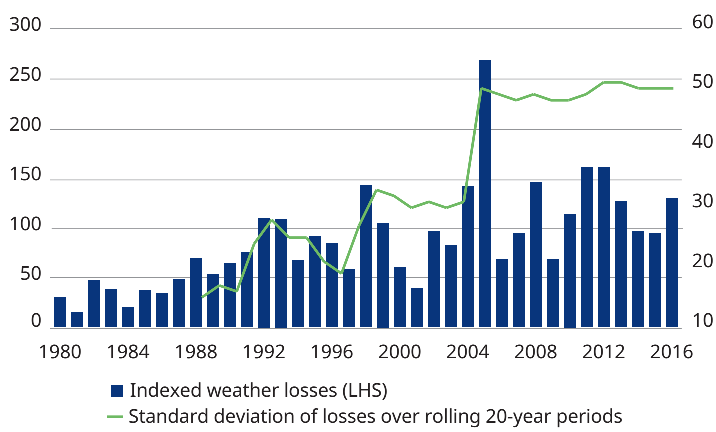
Figure 1: Greenhouse gas emissions, temperatures and disasters are all rising together



Source: EM-DAT, NASA, Schroders and UN FCC. Based on most recent data available in May 2018

Figure 2: Weather-related losses caused by climate change are growing

Indexed values of USD losses



Source: Munich Re and Schroders. Based on climate costs published in 2018

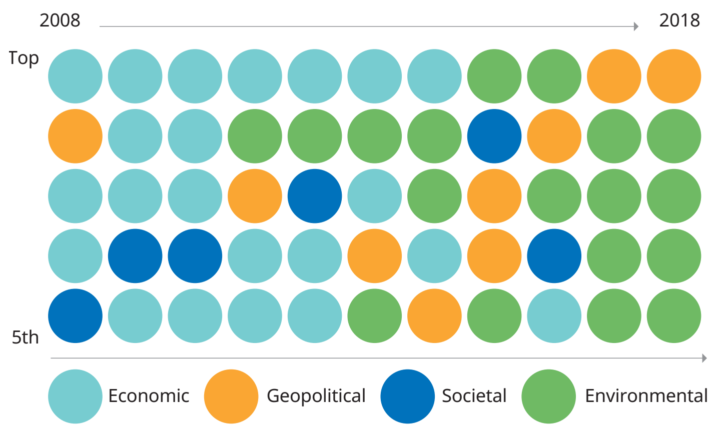
Businesses recognise the threat

Global business leaders recognise the risk climate change poses to their operations. The World Economic Forum's annual survey of business leaders, which asks them to identify the biggest risks they face, reflects growing concerns over environmental challenges and climate change in particular. Whereas a decade ago none of the top five risks reflected either social or environmental trends, this year's survey clearly reflected business leaders' understanding of the scale of the challenges ahead. Four of the top five risks are environmental (Figure 3).

Similarly, companies' responses to the annual survey run by CDP, a charity that promotes carbon disclosure, show that there is widespread appreciation of the strategic risks physical damage poses. The most recent responses to questions on physical climate risk are summarised in Figure 4 below. Around 80% of the over 2,500 companies canvassed identified risks stemming from the disruptive impacts of physical climate change, with capital-intensive industries generally most aware. Companies also recognise the urgency of the challenge, expecting risks to crystallise within four to five years across all sectors.

Interestingly, companies in the energy sector – which our analysis highlights as the most exposed – show relatively limited recognition of physical climate risks. We will continue to press companies in the industry to address the effects of climate change and formulate strategies to mitigate these risks. The views of companies in most other sectors are broadly in line with our fundamental analysis.

Figure 3: Sustainability has moved up corporate agendas



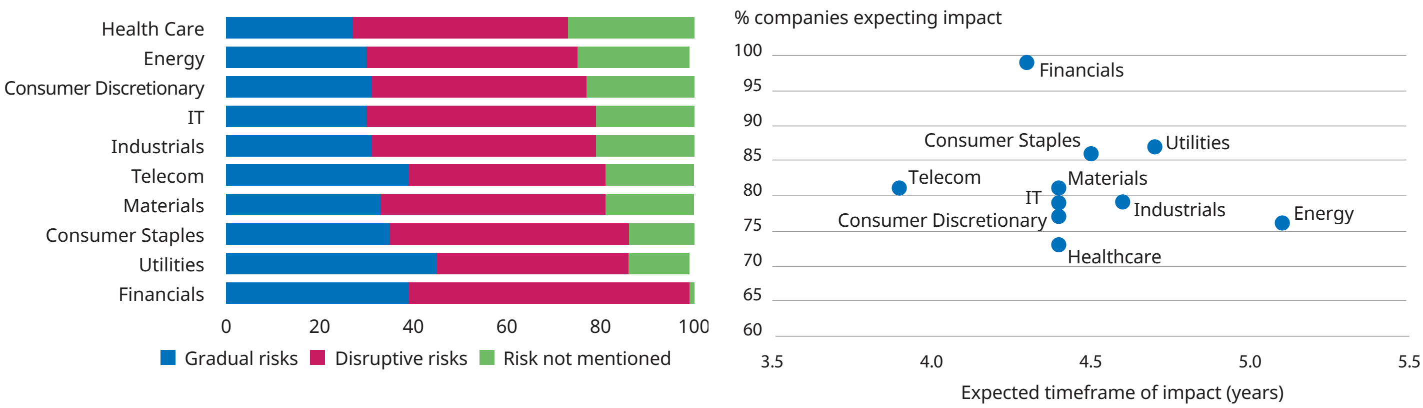
Source: World Economic Forum

In that context, the limited attention investors have paid to physical risks seems remiss. Climate risks are primarily viewed through three lenses: regulation, fossil fuel exposure and clean energy growth. All are important but rely on action to combat climate change that is far from assured. Physical risks, on the other hand, are likely to be unavoidable.

Figure 4: Energy aside, most sectors seem well aware of climate change risks

Proportion of companies expecting gradual or disruptive impacts from physical climate risks, by sector (%)

Expected likelihood of impact vs. timeframe of risk, by sector



Based on responses to a question in the most recent CDP survey where companies were asked: "Please describe your inherent risks that are driven by changes in physical climate parameters". Gradual risks include the responses: change in mean (average) precipitation; change in mean (average) temperature; change in precipitation pattern; change in temperature extremes; and sea level rise. Disruptive risks include: change in precipitation extremes and droughts; induced changes in natural resources; other physical climate drivers; snow and ice; tropical cyclones (hurricanes and typhoons); and uncertainty of physical risks. Multiple responses are possible. Companies were also asked about the timeframe for the risks they identified. We have plotted simple averages for each sector.

Source: CDP and Schroders as at June 2018.

Analysing the impact on individual companies

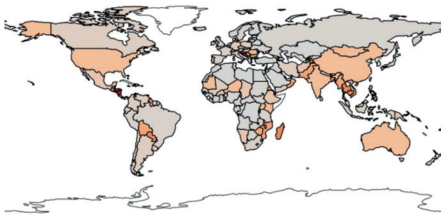
We have developed an objective framework to assess the valuation implications of companies' exposures to the risks of physical damage caused by climate change. The analysis is grounded on the premise that – in theory – companies could insure themselves against such risks. We have estimated the cost of buying a 13-year insurance policy to cover climate risks and plotted it against companies' enterprise values. (The 13-year policy life reflects our estimate of the average remaining life of a typical company's assets.)

Our methodology is illustrated in Figure 5 and explained in more detail in the appendix, along with the assumptions used. By putting a price on the cost of "neutralising" climate damage we create an objective assessment of the impact on corporate valuations. We realise this analysis is more theoretical than practical – we don't know of any companies that have taken out multi-decade climate insurance – but the approach provides a robust way to gauge physical risk exposures, and is commonly used to answer other investment questions[3].

3 The approach is similar to the "no arbitrage" approach often used to value financial instruments and risks, particularly in derivatives markets.

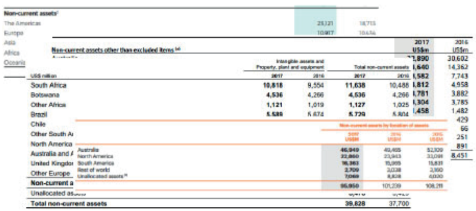
Figure 5: Translating national risks into company exposures

1 Objective measures of climate damage in each country



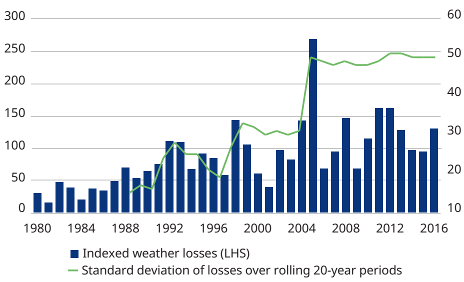
We examine the damage every country has suffered from the physical effects of climate change, using data from the NGO Germanwatch, which tracks the damage caused by climate change relative to the GDP of each country. We estimate regional risk levels based on constituent countries, weighted by GDP.

2 Companies' exposures to those climate risks



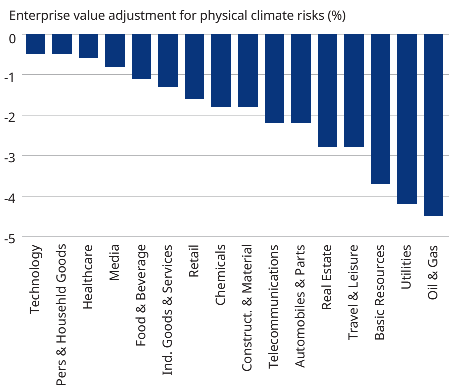
We translate companies' reported geographic exposures into consistent country names, or regions if country exposures are not disclosed. By mapping country or region risks to companies' geographic exposures, we estimate the average exposure companies currently face to climate damage.

3 Project growth in damage as climate impacts escalate



We project the expected damage in each country using MunichRe's historical data, which provides the basis to estimate how company damage will rise over the remaining life of their assets (typically c13 years).

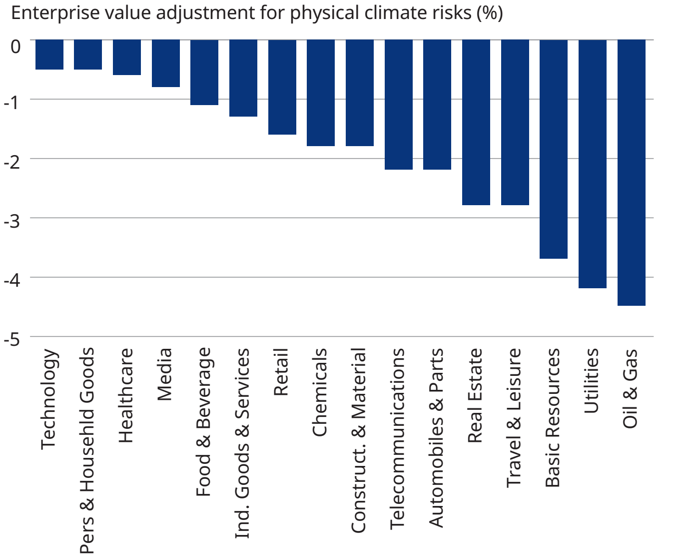
4 Estimate cost of insurance for life of companies' assets



Using standard insurance industry loss ratios, we estimate the annual costs companies would face each year to insure against climate damage to their operations based on the risk they face. We discount that payment stream to estimate the equivalent one-off payment covering the life of their assets, which is compared to current enterprise values.

Source: Germanwatch, MunichRe, Schroders estimates and calculations. All based on most recent data as of June 2018.

Figure 6: Sector exposures tend to vary according to the capital intensity of the business



Source: Schroders. Based on most recent data available in March 2018.
We have excluded financial sectors from this summary given the low direct exposure of their fixed assets understates the risk embedded in their assets or liabilities.

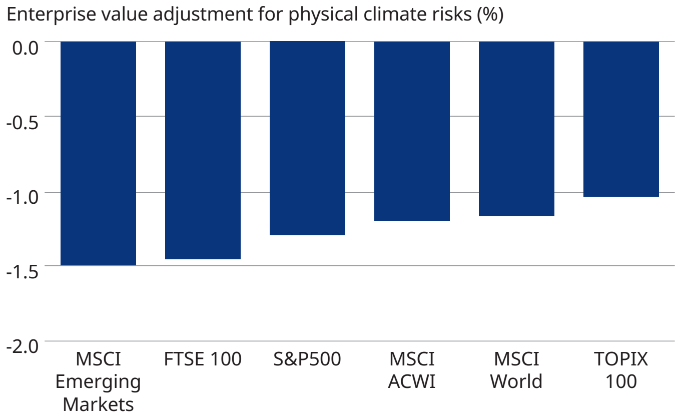
Applying our analysis to around 11,000 listed companies across the world provides a consistent and objective basis to assess firms', sectors' and portfolios' exposures to physical climate risk. Figure 6 ranks companies' exposures to physical climate risks in different sectors based on their estimated insurance costs divided by their enterprise value. Predictably, capital-intensive sectors operating in more vulnerable parts of the world face the biggest impacts, whereas those with asset-light business models are least exposed.

In addition to measuring individual company exposures, we have also developed tools to help fund managers gauge the risks facing their portfolios.

Combining company exposures with portfolio weights provides a high level view of risk, whether intended or not.

An illustration of the scale of risk facing global equities using the same estimated insurance costs/enterprise value formula is shown by the effect on six major world indices in Figure 7.

Figure 7: Overall risk exposures can be gauged from the impact on equity indices



Source: MSCI, Schroders. Based on most recent data available in March 2018

Conclusion

The damage inflicted by climate change through increasingly volatile weather patterns is rising quickly and is already significant for many companies. Despite being far more certain than risks stemming from actions and policies to limit its effects, physical damage receives far less attention from investors than analysis of mitigation efforts. Our proprietary framework assesses companies' exposures to physical climate risks, helping inform the decisions of analysts and fund managers, as well as gauging the exposures facing the portfolios they oversee.

Appendix

Physical risk exposure is calculated by combining country-level risk measures with companies' reported geographic footprints:

- Companies report the amount of their assets in different locations. Depending on the level of granularity provided, we map these locations on to a standardised list of countries or regions. Where companies do not disclose their geographic locations, we assume all of their assets are located in the company's domestic market.
- Separately, we calculate the current level of damage climate changes causes in each country using the costs/GDP ratios calculated by Germanwatch , an NGO (non-governmental organisation), based on Munich Re data. These ratios are averaged over 20 years, limiting the sensitivity of the analysis to annual fluctuations. We also calculate regional exposures by weighting country costs according to the GDP of the country in question.
- We calculate the expected annual damage to each company's assets using national or regional average cost ratios, companies' reported tangible assets and the geographic distribution of those assets.
- We extrapolate the multi-decade trend in climate damage (the global climate damage/GDP ratio has grown by 4.1% annually since 1980) to project expected damage up to 2030, a period which reflects the approximate remaining life of the average company's tangible assets.
- We estimate the costs of insuring against this expected damage using global average insurance industry loss ratios (around 0.6).
- We discount the future cost of the modelled insurance premia using 10-year US Treasury bonds to approximate risk free rates.
- We compare the present value of the modelled insurance premia to companies' current enterprise values to gauge the impact on firm valuations.

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