

CARBON-INDUCED FINANCIAL DISRUPTION

Linking climate science to investment risks and opportunities

“The emergence of new scientific data provides a clear end-date for the widespread use of fossil fuels. The timeframe for this is much sooner than expected and there are serious short to medium term implications for the valuations of carbon exposed companies.”

Phil Preston has worked in the finance industry for over 20 years in a variety of roles, culminating in heading the global credit research team at Colonial First State Global Asset Management, a division of the Commonwealth Bank. He is an expert on processes around credit and investment risk and is now an independent advisor to pension funds and other institutional investors with respect to the management of environmental, social and governance issues. Phil can be contacted at www.seacliffconsulting.com.au.

Paul Gilding is an independent writer and corporate advisor on climate change and sustainability with 35 years experience in the field. He is widely recognised as a global authority on business strategy and sustainability and has advised the CEOs and executives of many leading companies, including in Australia with ANZ and IAG and globally with DuPont, Diageo, BHP Billiton and Ford. His earlier career was focused on environmental organisations, including as head of Greenpeace International in Amsterdam. His current roles include Faculty at Cambridge University’s Program for Sustainability Leadership. His book on the economic implications of climate change, “The Great Disruption”, will be published in the USA and Europe by Bloomsbury in 2011. Paul can be contacted at www.paulgilding.com.

Copyright ©Paul Gilding and Phil Preston. The authors request that any use of this material is acknowledged and, where possible, copied to them.

The authors wish to thank all those who made helpful comments on earlier drafts of this paper, in particular Michael O’Sullivan (Australian Council of Superannuation Investors), Colin le Duc (Generation Investment Management), Don Reed CFA (PWC USA) and Raj Thamoeram (Network for Sustainable Financial Markets) – organisations shown for identification purposes only. The authors are responsible for the conclusions and any errors.

Executive Summary

Despite the intensity of the debate about climate science and its implications for business, there has been limited impact on the valuation of carbon exposed companies to date. This means that either markets are efficient and there is no material risk or that markets are inefficient and risks are present that haven't been properly priced.

New analysis of data from the scientific community suggests there is a wide gap between how markets currently assess climate related risks and the timing and scale of likely market and regulatory responses. Our analysis suggests the timeframe within which this gap is likely to close, and translate into revised market valuations, is now in *years*, not decades.

We provide discussion here that serves as a framework for investors who are developing their investment strategy response to these risks and opportunities. Our primary focus is on the most carbon exposed sectors, the coal, oil and gas extractive industries. We will show they are directly exposed to substantial, unpriced risk. Our secondary focus is the market wide impacts.

In summary, the emergence of new scientific data provides a clear end-date for the widespread use of fossil fuels. The timeframe for this is much sooner than expected and there are serious short to medium term implications for the valuations of carbon exposed companies.

Science provides a useful and reliable basis for forecasting climate impacts on markets

Science is central to any analysis of business and investment strategy in the area of climate risk because, while the focus is often on policy and technology, it is science that is the *underlying* driver of all market implications.

We rely on scientists in many areas of society, such as medicine, engineering, flight and food safety, to interpret complex observations and forecasts in order to guide policy, company behaviour and market responses. With climate science having become so intensely politicised, our regular path towards such a rational response has become confused.

Under our normal approach of accepting the advice of peak science bodies there is negligible uncertainty in the basics of climate science. The peak US science body, the National Academy of Sciences, recently confirmed that climate change is occurring and is largely due to human activities, concluding this was in the category of "settled facts". This view is consistent with the equivalent organisations in 19 other countries.

The science also tells us that, if unchecked, climate change poses the risk of widespread economic disruption, potentially even leading to global economic and social collapse. As a result, based on the advice of the world's top science bodies, 2 degrees has emerged as the widely accepted upper limit to the warming above pre-industrial temperatures that can be allowed to occur if we are to maintain economic and social stability.

While 2 degrees of warming still has serious consequences, the world's governments, including the top emitters such as the US, China, EU and India, have accepted 2 degrees as the upper target for broad policy. This goal was endorsed by hundreds of global corporations such as Rio Tinto, General Electric and HSBC at the Copenhagen conference in 2009.

So with the link between human activity and climate change effectively a "settled fact" and the policy goal agreed, investors need to ask the question: *What are the implications for markets and, in particular, the likely timing of impacts on financial valuations?*

Two scenarios and their implications

With climate science and government policy both now indicating business as usual is not a possibility, we need to consider what *type* of dramatic change will occur. We conclude there are just two main, plausible scenarios:

- Scenario 1.** Governments take strong, urgent and decisive action this decade to put us on the path to limit warming to under 2 degrees. The burning of coal, oil and gas is reduced and then later eliminated.
- Scenario 2.** Governments fail to act in a reasonable timeframe and we lock in more than 2 degrees of warming, leading to runaway climate change.

A response to the climate science is clearly inevitable. The only uncertainty is the timing of that response and whether it comes in time to avoid the worst consequences. Scenario 2 is quite possible, but history suggests society tends to respond late but dramatically to major threats. So we focus our attention mainly on what we think is the most rational and likely outcome, Scenario 1, even though it feels somewhat removed from where we are today.

A study published by the highly respected German Government funded Potsdam Institute in the journal, *Nature*¹, provides a useful scientific framework for assessing the implications of Scenario 1. Once CO₂ is in the atmosphere, much of it remains there for a very long time, with around 20% still affecting the climate for more than 1,000 years. As such, what matters most is the *total amount* we put up there, rather than our emissions in a particular year. That gives us our “budget” – the total amount we can emit if we want to reduce the risk of exceeding 2 degrees to within a given confidence level.

The Potsdam Institute study concludes that we have a budget of around 890 billion tonnes of CO₂ emissions between 2000 and 2050 if we want to reduce the risk of exceeding 2 degrees of warming to around 20%².

The study then calculated how long it would take to use up that carbon budget if we carried on with business-as-usual growth in the absence of policy change. *The answer was 2024, just 14 years away.* Under this scenario, the Potsdam Institute concluded that more than 75% of proven, economically recoverable fossil fuel reserves would not be burnt³. *This suggests that, under Scenario 1, approximately 75% of known fossil fuel reserves may be of no economic value.*

A sudden stop to all coal, oil and gas consumption in 2024 is not realistic without inducing economic collapse. Therefore under Scenario 1, urgent action will have to be taken to reduce our fossil fuel use and manage down our carbon reliance sensibly. With an end date of 2024, a response that tracks this scenario is likely to trigger dramatic policy action to price or regulate carbon within the next 5 years, with significant implications for asset values.

But what about.....?

There are commentators who concur with the problem and then draw the conclusion that economic and market risk is not imminent. Generally, they do so for one or both of the following two reasons:

Firstly, they believe that governments won't act dramatically to force rapid change because of the economic risks posed by change. This view is based on experience which has proven to be correct to date - but will it stay correct? The science marches on without regard to politics, markets or

democracy. At some point, governments will have no option but to respond to the science and impose a harsh price on emissions and take other measures designed to achieve the agreed policy goal. They will do so when the political and economic risks of not acting exceed the risks of acting.

Secondly, some argue that technology such as carbon capture and storage (CCS) will save us from disruptive economic change and allow business-as-usual to continue. CCS can work – but can it work at an economically competitive price? A recent McKinsey report estimates that the cost would be in the range of USD\$50-100 per tonne, which may prevent CCS from becoming commercially viable; particularly with the unit cost of renewable energy solutions now falling rapidly as production scale increases. The small amount of commercial investment in CCS compared to the \$100 - \$200 billion per annum going into renewable energy summarises the market's view of their relative potential. Relying on the mass deployment of CCS to rescue the fossil fuel sector, given the short timeframe available, is a very risky assumption.

From our perspective, there is a strong case for an outcome that includes significant government action and the abandonment of CCS as a competitive solution.

There is now a timeframe for market impact

How are investors planning for the two scenarios that we outline? We observe that, so far, there has been a moderate level of awareness and recognition of the issue, as evidenced through initiatives such as the Investor Group on Climate Change⁴ and the Carbon Disclosure Project – but there has been limited mainstream action in response. Although our analysis is based on public information, the implications of the science leads us to question whether the investment risks we outline are being adequately recognised and managed by investors.

One of our key conclusions is that, regardless of what government *actually* does, the market will at some point respond to the political and commercial risk of the *potential* for government to act. This is why the science is such an important basis for investor analysis.

The emergence of a budget on carbon emissions within a tight timeframe is a 'rubber band' of tension waiting to break. When it does, the impact will be felt directly and heavily by coal, oil and gas extractive industries because the valuations of those companies are driven by the potential value of their proven and probable reserves. Downstream energy intensive industries will also be at risk.

Given that a CCS rescue seems unlikely based on current market signals, companies in these exposed industries will need suitable hedging strategies to remain viable. The commercial decisions these firms are making today do not align with this approach. If investors accept the dominant scientific conclusions, they must also now accept that the market is inefficient with respect to the identified risks and opportunities. Put simply: investors are paying too much for a share in the profits of carbon-exposed companies and their capital could be better deployed in other areas.

Whilst no one can predict the precise moment of change, the realisation that we *have* a carbon budget and a tight timeframe for effecting change gives investors clear boundaries within which to operate.

Investment issues

If our two scenarios are accepted, then the re-rating of carbon costs will have ripple down effects throughout the broader economy and will be differentiated by company and sector. The Potsdam

Institute analysis puts a clear boundary on our response time if we are to see Scenario 1 prevail. The amount of action to be taken in the near term is substantial. Some carbon-exposed companies will be fully prepared, some will manage to get by and others will fail.

As was outlined in the findings of the Stern review, in present value terms, the cost of acting today is less than acting in the future, and pales in comparison to the costs of failing to act. Many analyses and commentators have drawn similar conclusions⁵. This conclusion will drive governments to act.

An overall positive is the need for broad capital investment in the solution, which, despite extensive disruption, may well deliver net economic benefits. After all, our entire energy infrastructure needs re-designing, which creates a massive amount of business activity and potential for innovation. The 2009 World Energy Outlook by the International Energy Agency (IEA) forecast that US\$10.5 trillion in *additional* capital spending would be required for energy infrastructure under a proactive response to climate change between now and 2030.

Changes in technology and systems have occurred regularly in the past. As an example, recall the wireless telecommunications revolution that caused a good deal of market disruption early last decade. It is worth noting that such innovations are often discretionary, meaning that there was a point in time when service providers designed and rolled out new products because they saw commercial advantage in doing so. The dynamics of climate change are quite different because it is a complex global issue and scientific research indicates that there is little discretion available to us.

However it unfolds, some companies and industries will be winners and some will be losers. The challenge for investors is to accurately assess these risks and opportunities across their portfolios.

What are the “alpha” and “beta” implications?

At the forefront of the adjustment will be the coal miners and integrated oil and gas producers, whose stock prices are heavily aligned with the expected value of their reserves. In the absence of any major strategic changes, the Potsdam Institute analysis implies that their future revenue streams are highly uncertain.

While it is true that such an economic shift would see enormous opportunities for investors in replacement energy sources and technologies, it is possible that such a transition would be protracted and volatile. Oil and gas producers and diversified resources companies account for more than 25% of the FTSE 100 index⁶, so market indices will be subject to performance and compositional volatility.

The performance of companies will be varied – in fact more varied than you’d expect in normal economic and market environments. The *dispersion* of company share price returns will be higher than usual – much like those of financial firms during the 2007 - 2009 period. The rapid revaluation of those firms during that period also gives us an insight into how fast and dramatically markets can respond when structural issues take hold. This sets up the prospect of a carbon-induced ‘alpha paradise’ that skilled investors will be able to exploit. It also highlights how critical it is for companies to manage and diversify their carbon risk.

Whilst short-term economic performance and market movements are likely to become volatile, there is no reason to believe that asset write-downs in certain industries and sectors cannot be matched by asset growth and value creation in others over longer timeframes. Avenues for generating portfolio alpha include asset allocation, sector allocation, stock selection and themed investments.

Beyond listed equities

The investment impacts would affect all asset classes. For bond investors, there are implications on many fronts that flow from a response to climate change. For example, government expenditures, and therefore debt levels, would be expected to rise unless the savings capacity of the private sector can be successfully harnessed. At the macro level, a rapid devaluation of traditional energy-based assets would present new sources of geopolitical risk, adding to risks attributable to resource scarcity. We recently witnessed a sovereign state, Russia, choosing to dishonour international wheat sales contracts in order to shore up its own food supply security. Such actions may turn out to be relatively minor compared to the issues that could arise from cross border energy tensions.

While such a context may be hard to imagine today, if global political and economic stability is seriously threatened, government responses could resemble those seen during mobilisation for war. In fact such a war like mobilisation on climate risk is now considered by some experts as the most likely outcome, arguing this is perhaps the only way society could achieve the outcome that the science says is required⁷.

At the micro level, an array of credit risks at the company and industry level would unfold, especially for those involved in energy intensive activities. The strength of contracts and the ability of counterparts to perform their obligations will be tested, especially considering that long term contracts often underpin the viability of resource and energy-based projects. Contracts often include force majeure clauses that are designed to release parties from their obligations when exceptional circumstances prevent performance, such as national disasters, wars or industry nationalisation. With the prospect of rapid changes in geopolitics and the price and composition of energy supply, we may see a rise in the use (or attempted use) of such provisions.

This is an important consideration for unlisted assets held by pension funds, where infrastructure assets are popular. The value of these assets is often underpinned by government concessions or long term commercial off take agreements which, in a rapidly changing energy environment, could lead to performance failures.

How could investors respond?

Investors will choose their response depending upon their awareness of the issues and their current strategy. Those who prepare both strategically and operationally may feel uncomfortable whilst the inefficiencies last, despite having somewhat de-risked their portfolios. We observe there is reluctance for mainstream investors to move to the consensus position that carbon exposure is a significant investment issue – which the science dictates is inevitable. This is perhaps because carbon risk always appear to be far enough into the future to permit procrastination with little immediate financial penalty. The lack of serious government action to date has reinforced this view. The key message from the Potsdam Institute analysis is that this “future” is closing in on us and so are the corresponding impacts for coal, oil and gas extraction companies. Timing will, as always, be critical.

Markets could react to this predicament next month, next year or in 2014. We can't know exactly when, but logic suggests there could be serious traction gained at some point over the next five years that will lead to carbon-induced financial disruption on a global scale.

Those investors who put time and energy into formulating strategic responses before the market adjustments commence will be well placed to significantly outperform those who don't. Investing in process change *now*, rather than later, is akin to paying an insurance premium for future protection. A key area of focus should be the use of existing analytical tools and research to evaluate the level of carbon risk inherent in investment portfolios and the benchmarks they are measured against.

For investors, the *critical action* is to confirm assumptions about the future market implications of climate change. If Scenario 1 is not accepted as a guide to investment strategy, what is the alternative scenario upon which investment decisions are being made? If Scenario 2 is assumed, then in what time frame and in what ways are the economic impacts of runaway climate change being priced into investment decisions?

Planning for the future

The process of climate change and the substantial impact it is likely to have on investment markets is driven by science. The analysis performed by the Potsdam Institute is important because it puts a finite limit on carbon emissions, with 2024 being the date that all emissions must cease under a business-as-usual approach in order to secure an 80% likelihood of the agreed policy goal being achieved. This makes business-as-usual an unrealistic planning assumption. As a result, coal, oil and gas extraction companies face substantial risks, including 75% of their reserves being potentially worthless.

At some point, and most likely ahead of government action, the consensus view in the market will shift, leading to a substantial level of protracted disruption for investors. This carbon-induced financial disruption will present a major source of risk for investment portfolios and an opportunity to generate high levels of outperformance for investors. The impacts will extend across all asset classes.

We believe that it is critical for investors to confirm their assumptions about the implications of climate change and the two scenarios we outline provide a framework that can be used in that process.

¹ Malte Meinshausen et al, 'Greenhouse-gas emission targets for limiting global warming to 2 degrees C' in Nature, vol. 458 (30 April 2009) doi:10.1038/nature08017

² The analysis provided results for a range of risk levels, including 20%, 25% and 50%. We chose to use 20% in order to reflect a 1 in 5 probability – the boundary we believe society is likely to settle on as an acceptable risk – and used the Potsdam findings to reflect this level. Society may of course choose a probability level higher or lower than this which would affect the budget and timeframe accordingly.

³ The study based this figure on a mid-estimate from the literature that burning all such reserves would produce 2,800 Gt CO₂ emissions, with an 80%-uncertainty range of 2,541 to 3,089 Gt CO₂. Given that the carbon budget for the relevant chance of staying under 2 degrees is calculated at 890 Gt CO₂, and given that 234 Gt CO₂ was emitted between 2000 and 2006, this allows only 656 Gt CO₂ between 2007 and 2050. This would allow just 23% of current proven, economically recoverable fossil fuel reserves to be burnt in that period.

⁴ This is the Australian equivalent of the Institutional Investors Group on Climate Change

⁵ See for example Paul Krugman in 'Building a Green Economy', 2010

⁶ As at the end of May 2010: http://www.ftse.com/Indices/UK_Indices/Downloads/FTSE_100_Index_Factsheet.pdf

⁷ See for example the One Degree War Plan, Jorgen Randers and Paul Gilding at <http://www.emeraldinsight.com/journals.htm?articleid=1860356&show=abstract>