

INSIGHTS 05

THE TIME VALUE OF CARBON

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- > The Time Value of Carbon (TVC) can be used to value near-term action on greenhouse gas emissions.
- > We believe TVC is insightful for investing in the transition to a net zero economy.
- > In the run up to COP26 incorporating the full value of climate action could play a critical role in closing the near-term ambition gap.



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Decisions made by investors today will have huge impacts on future wealth. A quote often wrongly ascribed to Albert Einstein is that “compounding in financial markets is the 8th wonder of the world. They who understand it, earn it ... they who do not... pay it.” We think companies that take early action on greenhouse gas emissions will enjoy a similar benefit. And those that delay, will pay for it. Investors should take note.

INTRODUCTION

Climate action today is undervalued. In this piece, we explore the concept of the Time Value of Carbon (TVC):

The Time Value of Carbon is the concept that greenhouse gas emissions cut today are worth more than cuts promised in the future, due to the escalating risks associated with the pace and extent of climate action.

We believe this is of fundamental importance for investors, since our work depends on accurately assessing the value that companies can create far into the future, based on the assets and liabilities that they have today. It is also of great importance for the world, since any further delay to climate action will lead to devastating impacts.

The Time Value of Carbon arises from the ruthless maths of climate science. We need to think in terms of carbon stocks, as well as flows, because carbon dioxide (CO₂) continues to warm the planet for many decades after it is released. Globally, we emitted around 40 billion tonnes of CO₂ in 2020 despite the economic impact of the pandemic.¹ At this rate, we will exceed the carbon budget for 1.5 degrees of warming by 2030.

Differences across climate models mean that the carbon budget lies in a range, but on one recent estimate it is just 230 GtCO₂ for a 66% chance of keeping to 1.5 degrees warming above pre-industrial levels in 2100, or 440 GtCO₂ for a 50% chance.²

Uncertainty gives us further reasons to act now. 1.5 degrees has become the benchmark for climate action, in part because scientists believe a temperature rise beyond this level would increase the risk associated with long-lasting or irreversible changes. Potential tipping points in the climate system include disintegration of polar ice sheets, shifting monsoon rains and dieback of the Amazon rainforest – which would in turn release enormous volumes of carbon into the atmosphere.³

Against this backdrop, it clearly makes sense to cut emissions today, rather than in ten years’ time. A company that stops emitting CO₂ this year creates a benefit for the climate system each year into the future. Companies that start to cut in 2030 will have spent another ten years drawing from the global carbon budget, and by then the 1.5 degrees goal could be out of reach. This is why long-dated climate goals with no short term action are unacceptable. It is also why we believe that near term action creates considerable value.



THREE WAYS THE TIME VALUE OF CARBON IS MATERIAL FOR INVESTORS

It is perhaps obvious what these trends mean at the global level: we need to act now to avert the most damaging consequences of climate change. CO2 emissions must be cut by 50% by 2030 to keep the 1.5 degree goal in reach.⁴ (We urgently need steep reductions in methane and other greenhouse gases too, as we explore later in this piece.)

But what do the trends mean for individual companies? Might they be better off delaying action as long as possible? Some argue that it would give them more flexibility in the near term, and the solutions would become cheaper by the time they get around to it. We think the answer is a resounding no. It misunderstands the dynamics of transition to net zero, and misses the central importance of a net zero carbon business model in the economy of the coming years.

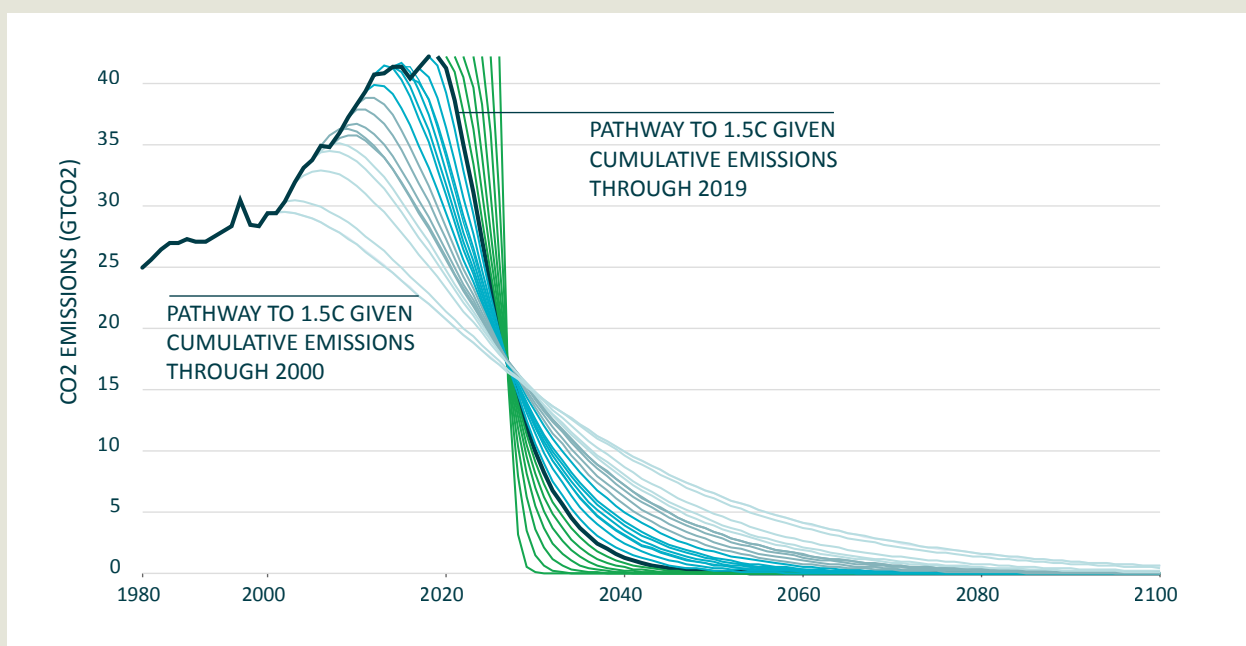
In this section, we explore three ways the Time Value of Carbon is material for investors, due to its implications for individual companies.

1. COMPANIES RISK FALLING BEHIND THE CLIMATE ACTION CURVE

What currently looks like a tough-but-achievable decarbonisation path will soon turn into an implausible dream for companies that are slow to act. Once they fall behind the net zero action curve they may well never catch up.

We have seen this already at the global level. This is how much steeper the path to 1.5 degrees has already become, due to the failure to collectively act sooner.

Figure: The journey to 1.5 degrees has become much steeper over time



Source: Robbie Andrews, CICERO and Carbon Brief.⁵

As the International Energy Agency recently concluded, the world still has a viable pathway to net-zero emissions in 2050, but it is narrow and requires an unprecedented transformation.⁶

But for companies too, moving slowly today increases the rate of change needed tomorrow. Companies that delay might be okay if everyone else pulls their weight. But this is hardly a safe bet. It's more likely that slower-than-hoped global action will eat into the carbon budget, further steepening the curve that individual companies will need to meet.

At present, emissions cuts of approximately 7.5% every year in intensity terms or 4.2% in absolute terms are required for a 1.5 degree pathway.⁷ To put this in context, the huge shock of COVID-19 in 2020 temporarily caused an absolute drop in emissions of about 7%.⁸ It's easy to imagine how the rate of change will climb out of reach for laggard companies.

2. THERE ARE DIMINISHING PROSPECTS FOR AN ORDERLY TRANSITION

The prospects for a smooth, orderly and predictable transition are diminishing. We want to see a strong carbon price, but once this eventually happens it will not be a silver bullet.

We are already seeing governments intervene with targeted instruments to get the job done. To take a few recent examples:

- > France has proposed a ban on domestic flights for trips that could be taken overland in a few hours.
- > Sales of internal combustion engine vehicles will end by 2035 or sooner in the EU, UK and California, and China is expected to adopt a similar policy.
- > New houses in the Netherlands are no longer connected to the gas network, and regulators elsewhere in Europe and in California are making similar moves.
- > In the UK, renting out properties below a minimum energy efficiency threshold is now illegal.⁹
- > Single use plastics bans have been introduced in the EU, UK, China, New York and California and in 34 African countries.¹⁰

We are also likely to see rapid shifts in market sentiment as investors begin to fully appreciate the scale of the challenge and get smarter at interrogating company climate action plans.¹¹

3. HEADING IN THE WRONG DIRECTION

Companies that are decarbonising rapidly and helping to deliver zero carbon solutions do much more than manage risk well – they are better positioned for an enormous opportunity.

Think about what the most valuable companies look like in a net zero world. They are not the ones with a vague plan to decarbonise by 2050. They are innovating today to position themselves for the rapidly growing markets for sustainable goods and services.

While most of the conversation on climate naturally relates to the physical assets responsible for emissions, much of the value of companies today lies in their intangible assets – things like networks, platforms, know-how and intellectual property. This makes us wonder whether there is significant potential for intangible stranded assets – intangible assets that turn out to be incompatible or poorly aligned with net zero.

The big German car companies suffered a sharp fall in share price in 2015. While the proximate cause was the dieselgate scandal, the Paris climate negotiations had also put the spotlight on greenhouse gas emissions from vehicles. The intangible assets these companies had built to make high quality engines – specialist engineering teams, patents, a century of knowhow, and a brand built on engine performance – were suddenly in question. The value lost was much more than defunct manufacturing equipment, it was an impairment to these intangible assets. For companies that haven't developed credible and bold strategies to transition to electric vehicles, it may be too late.

The bottom line is that not all climate action is equivalent, but the urgency applies to all companies in some form.¹² It is sobering that despite the proliferation in climate-related announcements, nearly all systemically important companies for climate action are failing to take the near term action required, according to the recent net zero benchmarking exercise by Climate Action 100+.¹³

An astute investor should value climate action today more than a plan to cut it tomorrow. But she should also think deeply about how these dynamics could shape the future prospects of companies. Below, we explore the concept of the Time Value of Carbon from a few different perspectives, starting with our own investment process.



SO HOW SHOULD INVESTORS APPROACH THIS CHALLENGE?

BQ AND MQ

At Generation, we rigorously evaluate two dimensions when considering a company for investment: business quality and management quality. Both need to be high for us to invest in a business.

To evaluate Business Quality, we consider factors such as barriers to entry, level and durability of returns on capital employed, risks of disruptive change, and the health of the ecosystem the company operates in. To evaluate Management Quality, we consider factors such as the long or short term orientation of the company strategy, a company's purpose and culture, alignment and incentives of management and how a business manages its people.

These are standard considerations for a long-term investor. Now consider how the Time Value of Carbon may alter one's evaluation of these items with an example. Two auto suppliers with similar businesses have different commitments and plans on carbon. Company A has a general commitment to reduce emissions by an as yet undetermined amount by 2050, and Company B has committed to net zero by 2050 and to halve its emissions by 2030, with capital allocation plans that will credibly deliver sufficient progress in the next few years.

It is highly likely that Company A is largely going about Business As Usual (2050 is far away!) while Company B is collaborating and forming partnerships with complementary, like-minded organizations (cutting emissions in half is hard, and can rarely be done alone). They are tracking and trialling new technologies that will make their operations more efficient and potentially open up markets they aren't currently in. They are seeking out innovative and purpose-driven employees who will help them think differently about 'how things are done', ensuring success with the next generation of customers. They are making themselves think differently about the future. And so the flywheel forms.

We believe that companies that make the quickest, boldest commitments may be able to take advantage of their first mover status. As Steve Howard put it in his former role as Ikea's Chief Sustainability Officer: "go all-in, go 100 percent, because then you stop investing in the old stuff, you invest in the new stuff, you lower costs, you use your supply chain and your creativity and you get the prices down... People sometimes think that 100 percent's going to be hard, and we've had the conversation in the business. Actually, we found 100 percent is easier to do than 90 percent or 50 percent. If you have a 90 percent target, everyone in the business finds a reason to be in the 10 percent. When it's 100 percent, it's kind of clear, and businesspeople like clarity, because then you just get the job done."¹⁴

UNCERTAINTY, RISK AND OPTION VALUE

Investors understand how to manage risk. Over the long term, good judgement on trading off risk and reward is how we create value for our clients. A much more difficult challenge is uncertainty.

So how might the Time Value of Carbon concept help us to convert climate and ecological uncertainty to risk?

One approach involves adding the future cost of carbon to a discounted cash flow analysis. The implied carbon price would need to rise over time, consistent with a 1.5 degree pathway. To give a sense of this, in most 1.5 scenarios, modelling exercises put the cost of carbon in the \$150 to \$300 / tCO₂ range in 2040. In the EU, the current price is around 50 Euros/t.

But if we model a smooth glide path, we might be caught out. For one thing, if the world moves too slowly in the next year or two, the costs of carbon in 2030 and 2040 will need to increase meaningfully, to move us back onto a 1.5 path. Plus, as we note above, we are likely to see regulations, bans, mandates, quotas and other more interventionist policies that impose very significant costs for companies that have failed to take climate seriously.

The sustainability expert Alex Steffen puts this more bluntly: a vast array of industrial and business practices have no future, and are about to be priced accordingly.¹⁵

We may therefore need to take a more adaptive, dynamic approach to valuing early action. We have been thinking about how to do this in practice. One possibility is to use option pricing theory. The Black-Scholes model for option pricing, for instance, requires a few inputs, including importantly, the price volatility of the underlying asset.

A company that is reducing their emissions today is creating a real option for themselves, which given the wide range of outcomes on what a fair price on carbon will be in the future, is arguably quite valuable. Long-term investors are inclined to invest in businesses that are rich with real options. Companies taking climate actions sooner are also creating real options for themselves that investors should value.

TIME HORIZONS

Capital allocation often has long-lasting impacts. Some of the most hotly discussed areas of sustainable transition have a lot to do with timing. So, we need to make sure that the Time Value of Carbon can capture this part of the story. We highlight three areas of particular interest below.

1. DEEP DECARBONISATION

The transition to net zero is a transformation, not an incremental shift. We need to consider the value of investment in net zero aligned capital allocation that may take a few years to deliver deep emissions reductions.

Research and development into battery technologies is needed to help cut emissions in future vehicles and the electricity grid. However, a TVC based only on greenhouse gas emissions saved yesterday would miss this. As we note above, we also need to make sure that we value intangible assets consistent with near term climate action.

There is also the potential for stranded assets. Replacing a coal power station with a gas plant today cuts emissions to a degree, but adds a new polluting asset designed to operate for decades into the future. This particular example has been contentious in the new EU taxonomy, since new gas infrastructure in Europe is not compatible with 1.5 degree scenarios.

In our mind, the key is to set a high bar. There are many methodological challenges for assessing alignment. TVC will only be useful if it places value on a clear and credible short term path to decarbonisation, rather than vague and long-dated net zero goals or moonshot research projects.



2. NATURE BASED SOLUTIONS AND CARBON REMOVALS

Timing is already a hot topic in virtual roundtables discussing the role of offsets and nature based solutions for net zero commitments.¹⁶

The term ‘time value of carbon’ has sometimes been used previously in the context of sequestering carbon in nature, or other forms of temporary carbon storage.

It takes time for carbon dioxide to be absorbed into trees and other vegetation. For instance, a landscape being reforested might sequester carbon at a rate of around 10 to 20tCO₂ per hectare, per year, over the first 20 years.¹⁷ The rate varies a lot according to the type of vegetation, the location, and the maturity of the forest.

Problems arise when claims are made about carbon removals from nature that will take years to achieve. Put simply, planting a tree today that will absorb carbon over decades is not a fair ‘offset’ for your company flights last year. The assumptions used to correct for this are important and contentious.

Avoided deforestation is very different. By not releasing the carbon, the benefit is immediate. But it is hard to see how companies can claim avoided deforestation as a contribution to their net zero goal, for instance, since these forests should not be cut down in any case.

In the run up to COP26, work is underway to clarify best practice nature-based solutions and carbon removal, including their contribution to net zero commitments. For the purposes of this piece, the main point to stress is that a gold-standard approach should be adopted whenever the Time Value of Carbon is applied to removals as part of net zero strategies. We are actively engaged in investor initiatives on nature based solutions and ending deforestation to work towards this goal.



3. NON-CO2 FORCERS

We are using the time value of carbon for shorthand, but what about other greenhouse gases?

The increasing risk of overshooting the 1.5 degree goal has put new emphasis on non-CO2 climate forcers like methane and hydrofluorocarbons. Slashing emissions from methane from fossil fuels, landfills and agriculture could reduce warming by 0.3 degrees Celsius by mid-century, according to a new UN assessment.¹⁸

Methane is over 80x more potent at trapping heat than CO2 over a period of 20 years, but it unlike CO2 it lasts only a few years in the atmosphere before breaking down. This means that whereas CO2 is best thought of as a stock, methane can be treated more like a flow. Turning off the taps now can deliver near term benefits to the climate, giving us a little more headroom for a 1.5 degree world.

Including non-CO2 forcers in the analysis highlights the importance of climate action in wider industrial and environmental systems. As the IPCC report on 1.5 degrees of warming noted, some of these forcers are emitted alongside CO2, particularly in the energy and transport sectors, so can be largely addressed through CO2 mitigation. Others require specific measures, for example, to target agricultural nitrous oxide and methane, some sources of black carbon, or hydrofluorocarbons.¹⁹



CONCLUSION

We believe early climate action is undervalued, particularly as it applies to companies.

Against a backdrop of rising climate uncertainty and transition risks, we hope our initial exploration of the TVC concept proves useful for investors assessing company quality and performance.

Properly valuing climate action would radically shrink the ambition gap on climate action. Despite the raft of net zero commitments this year, the world is nowhere near on course for 1.5 degrees.²⁰

TVC could also help bolster the integrity of finance sector net zero commitments in the run up to COP26. We have seen some major breakthroughs this year with the finance sector and corporates adopting net zero commitments. Now the focus is on implementation. TVC might provide an investor-relevant framework for bridging the gap between net zero goals and near term emissions reductions plans.

Properly recognising TVC would help to reveal and accelerate the huge opportunities available to investors from emerging net zero business models.

Policy makers might also find it useful to compare TVC with the well-established concept of Social Cost of Carbon (SCC). SCC approaches are based on an assessment of climate damage in the future, with a discount rate applied. They are instrumental in national climate policies in many countries. TVC instead discounts future climate action (or rather, places a premium on near term action). This shift in perspective might help to ensure that carbon pricing and other policies are shaped by the pace of action required to meet net zero goals.

The next step for us will be to refine and further implement TVC in practice. Of course, climate action already features heavily in our investment process. But we have set ourselves the task of more accurately assessing TVC as it relates to our companies. We hope you will join us on this journey – and work with us to refine and stress test this concept, so that we can be sure it is driving impact in real economy emissions in line with global climate goals.

REFERENCES

1. This figure includes an estimate of CO2 from land use change. See Carbon Brief [article](#).
2. Damon Matthews, H., Tokarska, K.B., Rogelj, J. et al. An integrated approach to quantifying uncertainties in the remaining carbon budget. *Commun Earth Environ* 2, 7 (2021). See [website](#).
3. See Carbon Brief article on [tipping points](#).
4. The IPCC found that a 45% cut by 2030 was required in their 2018 [report](#) on 1.5 degrees of warming, this has recently been interpreted as a 50% cut this decade.
5. See original article and data at CICERO [website](#). Graphic based on a [visualisation](#) of the data by Carbon Brief.
6. IEA (2021). Net Zero by 2050: A Roadmap for the Global Energy Sector. See [report](#).
7. This figure is used by the Science Based Targets initiative, assuming a linear reduction pathway. It is less steep than the trend in figure 1 because it assumes some carbon removals (based on an average of multiple scenarios). See [website](#).
8. See Carbon Brief [article](#).
9. See UK government [website](#).
10. See [report](#) by Greenpeace
11. CISL (2019), Unhedgeable risk: How climate change sentiment impacts investment. See [report](#).
12. See [article](#) on '10 myths about net zero targets and carbon offsetting, busted'. Myth 9 is: Each ton of carbon dioxide is the same and can be treated interchangeably.
13. See Climate Action 100+ [website](#).
14. For the Steve Howard speech see this [video](#).
15. See "The Last Hurrah", a [blog](#) by Alex Steffen
16. One example is the [work](#) of WRI on the Time Value of Carbon in the context of temporary carbon storage.
17. Bernal, B., Murray, L.T. & Pearson, T.R.H. Global carbon dioxide removal rates from forest landscape restoration activities. *Carbon Balance Manage* 13, 22 (2018). See [website](#).
18. See UN Global Methane Assessment [report](#).
19. See IPCC 1.5 report [Chapter 2](#).
20. See Climate Action Tracker [update](#).

IMPORTANT INFORMATION

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