



ESG

The challenge of accessing high-quality carbon offsets as part of the Net Zero transition

Why pricing and purchasing challenges risk undermining carbon offset procurement strategies

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The Business Briefings Series

The Business Briefings Series is a series of papers by PwC that provides a constructive breakdown of causes of mistrust in climate reporting by businesses today. Its intention is to support business leaders, boards and financial markets to build trust and support the flow of capital that will drive the transition to a net-zero economy.

Executive summary

Companies' use of carbon offsets has an important role to play in tackling climate change. As the narrative around climate action has shifted to Net Zero in recent years, there is a recognition that recourse to high-quality offsets to address so-called residual emissions may be required as an element of a comprehensive Net Zero strategy.

Voluntary carbon offset purchasing already features in the decarbonisation strategies of many companies. In 2022, FTSE 350 companies publicly reported purchases of voluntary carbon offsets totalling £38 million, according to data from CDP.¹ However, increased pressure from customers and investors means that more businesses are setting Net Zero commitments and forecasted demand for offsets is likely to increase. Many market analysts have suggested that the supply side response may be inadequate, implying that prices may rise significantly in the future.

BloombergNEF has developed pricing scenarios² for how voluntary carbon offset prices may evolve between now and 2050, depending on whether avoidance offsets continue to be accepted by carbon offset registries. Under the more moderate price scenario where avoidance offsets continue to be accepted, we have projected that, by 2030, the same volume of voluntary offsets FTSE 350 companies purchased in 2022 for £38 million could cost more than £135 million, a 256% increase. Prices of voluntary offsets are projected to continue to rise until 2050, when the cost of the same volume of offsets may peak at £365 million.

Over the last 15 years or so, the market has offered a wide range of voluntary carbon offset projects, including cookstoves, landfill gas capture and use, and the preservation of tropical forests. A consistent theme of critique has been the integrity of carbon offsets in the voluntary carbon market (VCM), especially relating to additionality (i.e. whether emissions reductions or removals would have occurred without the crediting activity) and the quantification of carbon credits (i.e. using methodologies that could risk overestimation).

Such scrutiny has amplified over the last few years leading to increased demand for improved market governance. Moves to enhance the quality and transparency of credits in the VCM may mean that companies have a more limited range of offset options in the future. For example, some stakeholders argue that only removal offsets (i.e. those generated from projects that extract and permanently store CO₂) should be permitted, compared to avoidance offsets which have dominated the market to date.

Under the BloombergNEF Removals scenario where removal offsets are deemed to be the only legitimate form of offsetting, we project that the same volume of voluntary offsets FTSE 350 companies purchased in 2022 for £38 million would cost £438 million by 2030, a 1,051% increase. Prices of offsets under this scenario are projected to peak in 2037, where the cost of current FTSE 350 purchases would rise to £2.6 billion.

The purchase volume of offsets varies by industry and, therefore, so does exposure to potential offset price variation. The energy sector, for example, reported the highest purchases of voluntary offsets in 2022, amounting to £27 million. Based on the same two price scenarios, this cost could rise to between either £249 million and £1.8 billion at the respective 2050 and 2037 peaks outlined above, which would represent a sector average of between 1.2% and 8.5% of 2022 gross profits.

Commercial sensitivity surrounding the price companies currently pay for the carbon offsets means that this information is not routinely disclosed through corporate reporting. When searching for key terms relevant to carbon offsets in the annual and sustainability reports of all FTSE 350 companies, we find that 118 companies (34%) include a reference to them.³ However, of this 118, only 19 companies (16% of the 118) make reference either to the price or cost of carbon offsets. Of these 19 companies, only seven (6% of the 118) discuss the potential for future price increases, which represents just 2% of the whole FTSE 350. This lack of transparency makes it hard for investors and other stakeholders to gauge how these risks might affect individual companies' Net Zero transition plans, with limited information available as to how businesses plan to mitigate against them.

There are a number of steps that companies can take to address these challenges, including making longer-term offset purchase agreements, developing internal carbon pricing mechanisms and, where possible, focusing on decarbonisation to reduce their exposure to future offset price rises. In addition, clear, consistent disclosure of a carbon offset purchasing strategy through annual and sustainability reporting – within the limits of commercial sensitivities – will provide critical transparency and reassurance for investors.

1 CDP. Climate Change Questionnaire 2022. Available at: <https://www.cdp.net/en/climate>

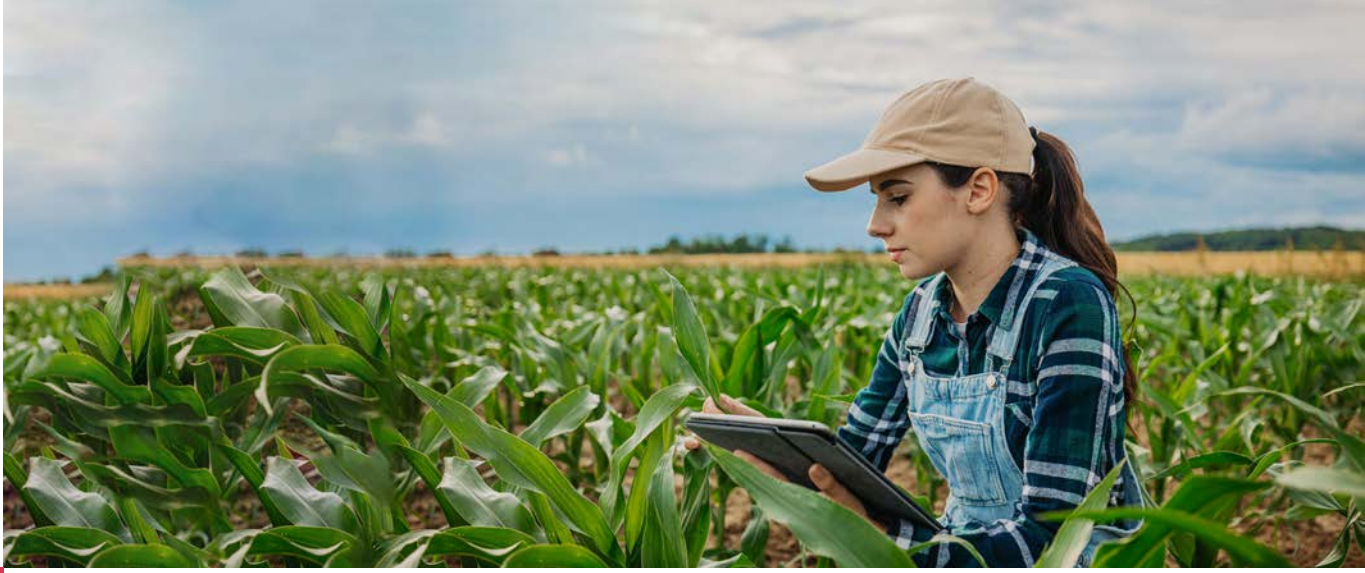
2 BloombergNEF. Carbon Offset Market Could Reach \$1 Trillion With Right Rules. 2023. Available at: <https://about.bnef.com/blog/carbon-offset-market-could-reach-1-trillion-with-right-rules/>

3 Annual and sustainability reports from FY22. It is noted that companies who do not buy any carbon offsets are unlikely to mention them in their annual or sustainability reports. We cannot distinguish between companies that don't mention carbon offsets but do purchase them, and those that don't mention carbon offsets and don't buy them.



Key findings:

- According to CDP data, FTSE 350 companies publicly reported purchases of **£38 million** of voluntary carbon offsets in **2022**.
 - The cost of this could rise to between **£135 million and £438 million in 2030**, and between **£365 million and £2.6 billion at its peak** under potential scenarios for carbon offset price rises estimated by BloombergNEF.
- The **energy sector** reported the **highest purchases in 2022**, spending £27 million on voluntary carbon offsets.
 - This could rise to between **£93 million and £299 million in 2030**, and between **£249 million and £1.8 billion at peak in 2050**, which would represent a sector average of between 1.2% and 8.5% of 2022 gross profit at peak.
- **No companies in the FTSE 350** currently report voluntary purchases of **carbon capture offsets** and the majority of offsets purchased are avoidance offsets.
 - 80% of total offsets purchased were from avoided deforestation, mixed and renewable energy project types.
- While many companies mention carbon offsets in their annual or sustainability report in 2022, **only 19 make reference to their price/cost** and only seven companies discuss potential price rises.



Introduction

Although not a new concept, the prevalence of voluntary carbon offsets is growing as businesses become increasingly conscious and more proactive in relation to their responsibilities to tackle climate change.

Paired with internal reductions in carbon emissions, high-quality, voluntary carbon offsets can act as an enabler in the transition towards Net Zero.

The focus of this paper is solely on the voluntary carbon market (VCM) and does not look at the implications of price changes in compliance markets such as the UK ETS or EU ETS.⁴

At the most fundamental level, companies will typically make recourse to the VCM to offset two types of emissions, namely:

- Emissions which have not yet been abated but will reduce over time as companies transition to Net Zero; and
- So-called “hard-to-abate” emissions which are difficult to reduce given the limits of current technologies in certain processes or operations, and so will need to be offset for a number of years until substitute technologies are available.

In addition to procuring for their own needs, some companies may also look to purchase carbon offsets as a service for their customers (B2B or B2C), typically offering an offset at point of purchase to enhance the attractiveness of the product or service.

There is currently a wide array of carbon offset project types available for businesses to purchase. These include avoided deforestation (REDD+), renewable energy and landfill gas capture that currently make up the largest market share. However, there are other initiatives that hold a smaller market share, such as efficient cookstoves, N₂O destruction and mini-grids, that also present notable offsetting opportunities. Despite the decarbonisation potential offsetting presents, projects are coming under increased scrutiny with claims of non-additionality, credit overestimation and non-permanence forming the focus of recent publications.

Lack of additionality occurs when the project has other driving factors beyond that of the crediting activity, such as supporting legislation or alternative monetary incentives to credit revenues. Risk of overestimation is also a common issue, usually arising from inaccurate emission baselines and the use of non-conservative calculation methodologies. Nature-based initiatives also struggle with assuring the permanence of offsets as these are likely to be reversed in the future without supporting buffer practices. These risk factors, alongside the provisions in place to mitigate against them, should be considered when making offset investment decisions.

⁴ Compliance carbon markets are created by national, regional or international policy. Emissions Trading Schemes (ETS) are one example of a compliance market where regulated companies are issued emissions allowances and, if they exceed these allowances, they must buy allowances from other companies. Voluntary carbon markets are not regulated in this way and any company can buy carbon offsets to meet their own objectives.



To try and address issues around integrity, various international standard setters are considering additional requirements and guidance, such as the ISSB's recent Exposure Draft and EFRAG's first draft of ESRS 1.⁵ The ICVCM has also recently launched its Core Carbon Principles (CCPs) which aim to be the new global threshold for high-quality carbon offsets.⁶ Regulatory and reputational pressures could lead to carbon offset registries restricting the type of offsets that can be issued or retired to those with more robust claims of additionality, or tightening calculation methodologies to reduce overestimation of carbon offsets. This would reduce the available supply of verified carbon offsets that businesses can purchase to meet their Net Zero goals.

The increase in demand, coupled with potential restrictions in supply from the above two trends, could lead to significant price rises in the VCM over the coming years. Rising prices could potentially lead to three consequences materialising for businesses as follows.

1. Businesses could struggle to meet their Net Zero commitments if they choose not to purchase voluntary carbon offsets due to higher costs.
2. A greater proportion of businesses' gross profit would need to be spent on purchasing voluntary offsets.
3. Investments in certain tangible emission reductions could become cost competitive and so hasten companies' progress towards decarbonisation.

This report uses scenario analysis to quantify the financial impact of potential price increases for offsetting carbon emissions on FTSE 350 companies⁷ and is structured as follows.

- Factors expected to drive future carbon offset prices in the VCM.
- Current cost of VCM offset purchases by sector and offset project type disclosed by FTSE 350 companies where available.
- Summary of external price scenarios for VCM.
- Potential financial impact of future price rises of voluntary carbon offsets.
- Conclusions and recommendations.

5 EFRAG. European Sustainability Reporting Standards. 2022. Available at: <https://www.efrag.org/lab6>

6 ICVCM. The Core Carbon Principles. 2023. Available at: <https://icvcm.org/the-core-carbon-principles/>

7 Our analysis defines the composition of the FTSE 350 as it was as of 1st January 2023.

Avoidance vs removals

Carbon offsets can be issued by projects which either reduce emissions through activities that prevent or avoid emissions that would have otherwise occurred (known as avoidance offsets), or through activities which actively remove and store greenhouse gases (GHGs) from the atmosphere (known as removal offsets). Purchasing avoidance offsets should reduce GHGs emissions in the future, while purchasing removal offsets removes GHGs that have already been emitted from the atmosphere.



1. Factors expected to drive future carbon offset prices in the voluntary carbon market

While the exact magnitude is uncertain, voluntary carbon offset prices are widely expected to increase by 2030.^{8,9} There are a number of demand and supply fundamentals that could underpin this price rise, some of which we comment on below.

- Increased pressure from customers and investors leading to more businesses setting Net Zero commitments. Nearly 40% of the FortuneGlobal 500 now have a Net Zero target of some kind - although nearly a third do not include value chain emissions - and this number is climbing each year.¹⁰
- This, in turn, will increase base demand for voluntary carbon offsets to ensure that residual emissions are addressed in the Net Zero journey. In conjunction with a lack of supply response, this could underpin significant price increases.

- The agreement at COP26 on guidelines for implementation of Article 6 of the Paris Agreement could lead to a significant increase in demand for carbon offsets from government and non-state actors. Article 6 covers how countries can collaborate across borders on climate change mitigation through international carbon markets.
- The cheapest forms of offsets currently in use could be retired over the next few years and so would no longer be available on the VCM, forcing offsetting businesses to shift to more expensive carbon offset project types.
- There could be an increasing push for businesses to use more removal offsets that specifically remove carbon from the atmosphere. This could be due to regulatory, consumer or investor pressure. However, the supply side is currently rather inelastic and many projects will take a number of years to become viable.

In summary, a combination of these factors could lead to material increases in the price of voluntary carbon offset purchases in the future. Accordingly, businesses may begin to take on more price exposure related to offsets and may need to provision accordingly.



8 Trove Research. Future Demand, Supply and Prices for Voluntary Carbon Credits - Keeping the Balance. 2021.

9 BloombergNEF. Carbon Offset Market Could Reach \$1 Trillion With Right Rules. 2023. Available at:

<https://about.bnef.com/blog/carbon-offset-market-could-reach-1-trillion-with-right-rules/>

10 Climate Impact Partners. If not now, when? 2022. Available at: <https://www.climateimpact.com/news-insights/fortune-global-500-climate-commitments/>

2. Current cost of voluntary carbon offset purchases by FTSE 350 sector and offset project type

Context

To estimate the financial impact of potential voluntary carbon offset price rises on FTSE 350 companies we first need to understand the companies' current pattern and volume of offset purchases. Voluntary offset purchasing patterns are by no means uniform across the FTSE 350. The volume and mix of different types of voluntary offsets purchased varies considerably by sector in the FTSE 350. CDP's 2022 Climate Change Questionnaire¹¹ collects data on current offset purchases for 188 of the 350 FTSE companies.

Approach

To estimate the volume of purchases both by sector and offset project type, we use data from CDP's 2022 Climate Change Questionnaire. For the FTSE 350 companies which responded to the questionnaire, we estimate their spending on voluntary carbon offsets as a proportion of gross profit using their latest submissions available.¹²

Results

We summarise FTSE 350 reporting on voluntary carbon offset purchases by sector below in Figure 1.

Figure 1: FTSE 350 reporting on voluntary carbon offset purchases by sector

Sector	Number of companies in FTSE 350	Number of companies reporting to CDP	Number of companies reporting voluntary carbon offset purchases	Percentage of companies who report purchasing voluntary carbon offsets by sector
Financials	129	33	18	14%
Industrials	46	36	7	15%
Consumer discretionary	45	27	6	13%
Real estate	29	13	6	21%
Materials	22	17	2	9%
Consumer staples	20	18	7	35%
Information technology	17	12	2	12%
Communication services	14	8	3	21%
Health care	11	11	2	18%
Utilities	9	7	2	22%
Energy	8	6	3	38%
Total	350	188	58	

Source: PwC analysis of CDP 2022 Climate Change Questionnaire

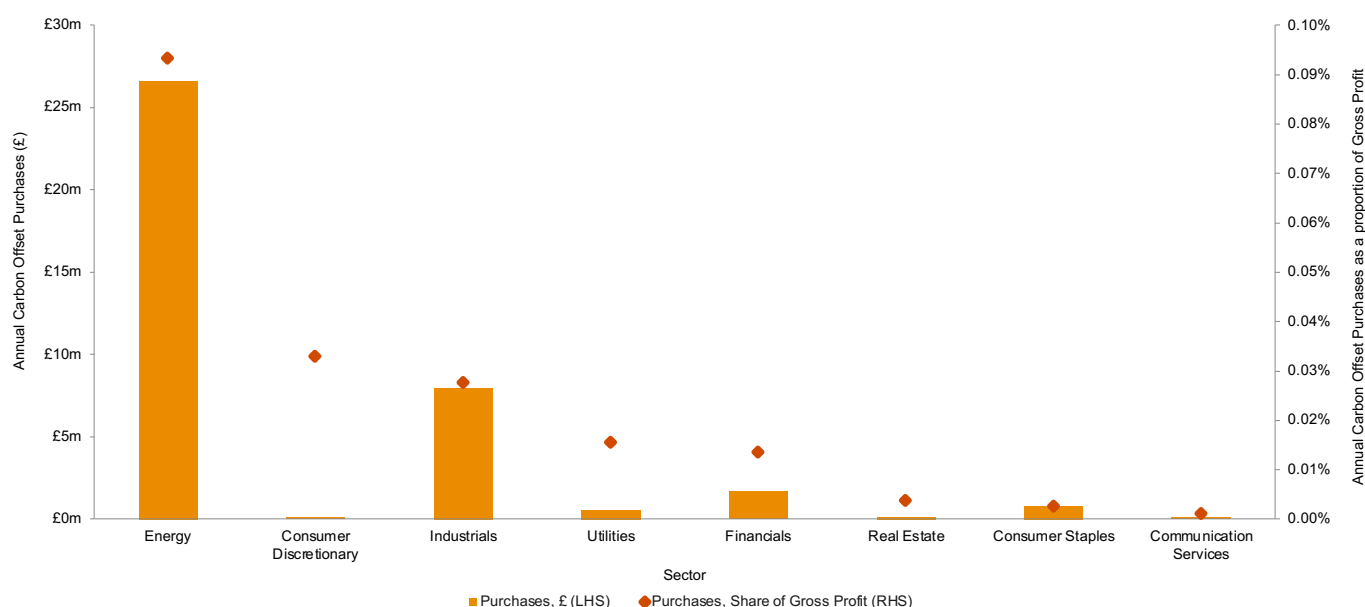
¹¹ CDP. Climate Change Questionnaire 2022. Available at: <https://www.cdp.net/en/climate>

¹² We describe our approach in more detail in the Technical Methodology in the Appendix of this report.

A total of 188 companies from the FTSE 350 submitted public responses to CDP's 2022 Climate Change Questionnaire.¹³ From our analysis we find the following.

- Healthcare is the FTSE 350 sector with the highest proportion of companies completing CDP's Climate Change Questionnaire, with all 11 companies in that sector submitting responses for 2022.
- The financial sector has the lowest proportion of companies reporting to CDP, with only 26% of FTSE 350 companies in that sector submitting a response.
- Of the set of companies that responded to the CDP Questionnaire, 58 publicly reported purchasing voluntary carbon offsets during the previous year¹⁴ and the amount in tonnes of carbon dioxide equivalent (tCO₂e) offset.¹⁵
- The energy and consumer staples sectors have the highest share of companies which reported purchases of voluntary carbon offsets during the previous year.
- The materials sector has the lowest share of companies that reported purchases of voluntary carbon offsets during the previous year.

Figure 2: Chart showing FTSE 350 2022 purchases of voluntary carbon offsets by sector i) in absolute terms and ii) as a share of gross profit.



Source: PwC analysis of CDP's 2022 Climate Change Questionnaire data

Figure 2 shows which sectors of the FTSE 350 purchase the largest volume of voluntary carbon offsets both in terms of purchase value and as an average proportion of their 2022 gross profit.¹⁶

Based on our analysis, the total spending on voluntary carbon offsets by FTSE 350 companies publicly reporting to CDP was £38 million in 2022. The energy sector spends the most on voluntary carbon offsets, at around £27 million. This is more than twice the amount spent by all the other sectors combined in the FTSE 350 sample.

In relative terms, the spending on voluntary carbon offsets by the energy sector amounts to around 0.09% of its gross profits on average, which is the highest share recorded when compared to the other sectors. The industrial and financial sectors are the second and third biggest spenders on voluntary carbon offsets amongst the FTSE 350, purchasing a total of around £10 million in 2022, making up 0.03% and 0.01% of their current gross profits, respectively. As a share of gross profit, the consumer discretionary and utilities sectors spend the second and fourth highest on voluntary carbon offsets, respectively.

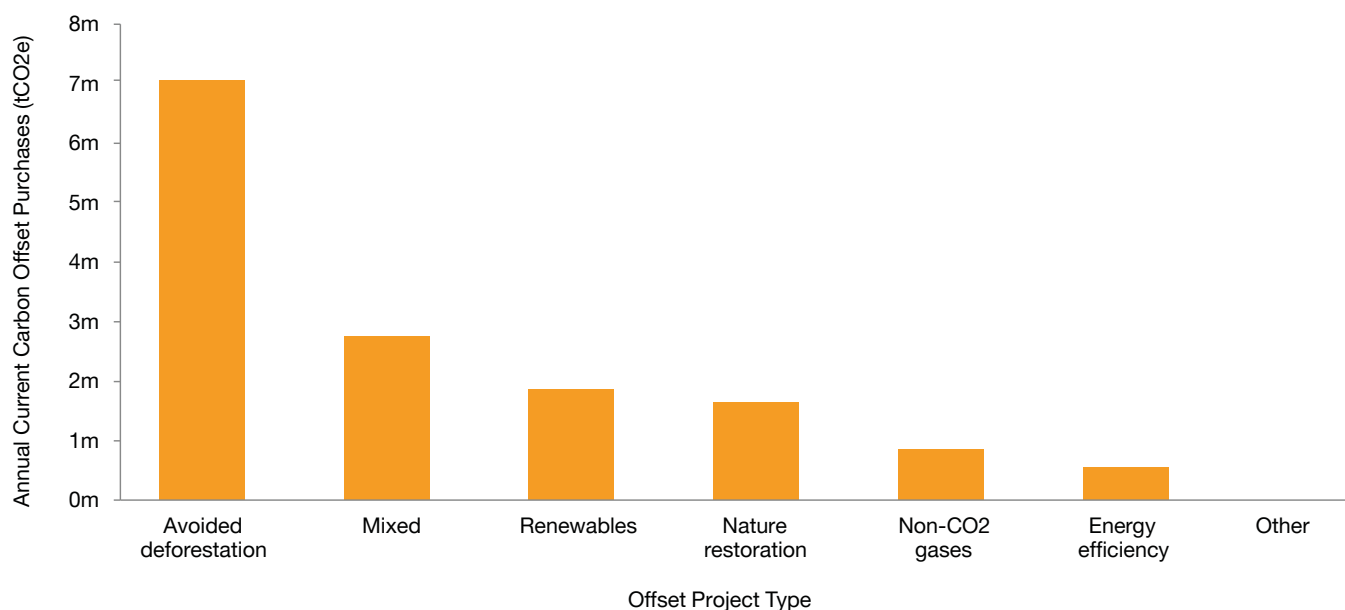
¹³ At the time of global release i.e. 13/12/2022 and excluding those who responded privately.

¹⁴ In the responses to the 2022 CDP Climate Change survey, the periods for which responding companies report the volume of voluntary carbon offsets they purchased in the previous year differ. All report for a 12-month period but the start and end month are not consistent across all companies.

¹⁵ CO₂e is a measure used to compare emissions from different GHGs based on their global-warming potential.

¹⁶ This analysis only covers the volume of voluntary carbon offset purchases publicly reported to CDP in 2022 by FTSE 350 companies. It does not cover purchases by FTSE 350 companies who do not publicly report their voluntary carbon offset purchases to CDP and so the total purchase volume can be thought of as a lower bound.

Figure 3: Breakdown of FTSE 350 2022 purchases of voluntary carbon offsets by offset project type



Source: PwC analysis of CDP's 2022 Climate Change Questionnaire data

Figure 3 shows how FTSE 350 companies' spending on voluntary carbon offsets varied by project type.¹⁷ The most popular carbon offset project type chosen by the companies listed in the FTSE 350 is avoided deforestation.¹⁸ Avoided deforestation offsets protect forests at risk of being cut down and are avoidance, rather than removal, offsets as they do not actively remove greenhouse gases from the atmosphere. This form of voluntary carbon offset has come under increased scrutiny recently with reports that the carbon reductions claimed by avoided deforestation projects have been overestimated.¹⁹

Renewable energy offsets for 1.6 million tonnes CO₂e were purchased by FTSE 350 companies for voluntary offsetting. As renewable energy is now cost-competitive in many countries, it is argued that many renewable energy offsets are not truly additional as the switch to renewable energy would have occurred without the need for the funding from the sale of the offset. Offset project types involving the capture and destruction of non-CO₂ gases and projects improving energy efficiency were the next most common project types purchased by the FTSE 350.

2.4 million tonnes of offsets were of mixed project type, involving multiple types of carbon offsetting such as avoided deforestation and energy efficiency. Based on our analysis, we found no companies in the FTSE 350 which bought carbon capture offsets on the voluntary market.²⁰ Carbon capture is a removal offset and can permanently remove carbon from the atmosphere. However, it is also significantly more expensive per tonne of CO₂e than other more well-established forms of carbon offsets: carbon capture contracts traded at an average of £68.84 per tCO₂e between October 2022 and March 2023, compared to £3.48 for forestry carbon contracts.²¹ Until carbon capture technology can benefit from greater economies of scale, this premium may put companies off buying this type of offset.

17 The offset project types reported to CDP have been mapped to broader offset project types. The broader project types are used in these charts. We describe our approach in more detail in the Technical Methodology in the Appendix of this report.

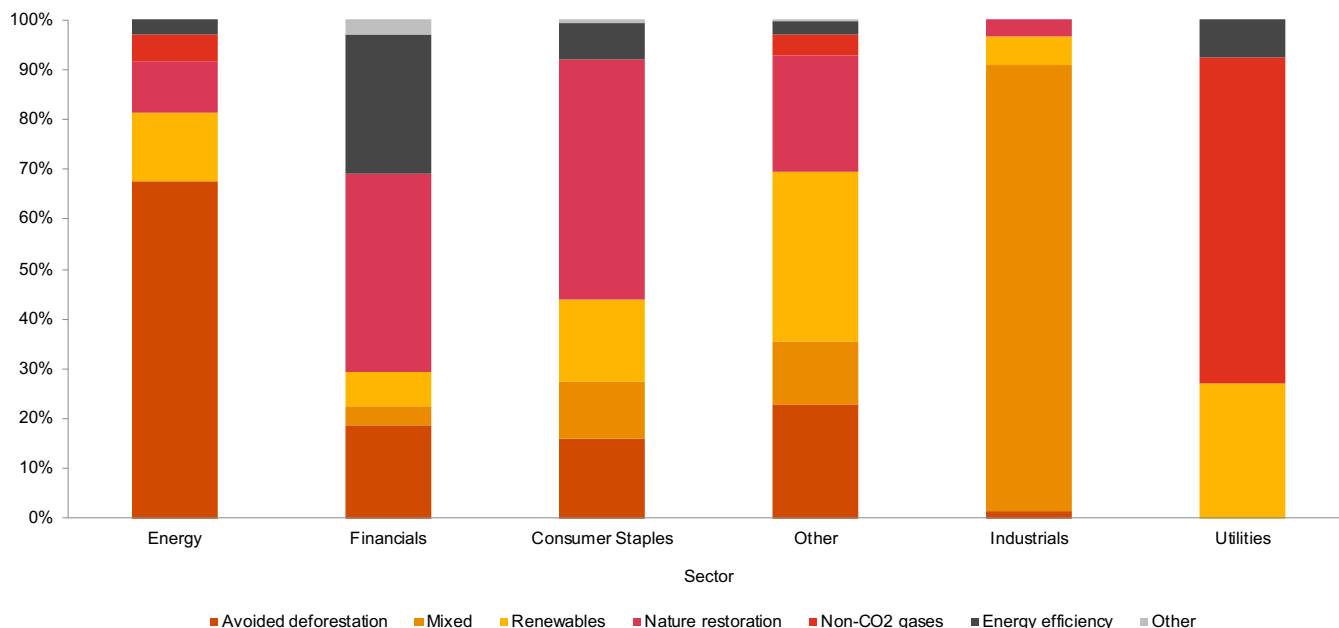
18 Reforestation and afforestation projects are captured in the nature restoration offset project type.

19 The Guardian. Revealed: more than 90% of rainforest carbon offsets by biggest certifier are worthless, analysis shows. 2022. Available at: www.theguardian.com/environment/2023/jan/18/revealed-forest-carbon-offsets-biggest-provider-worthless-verra-aoe

20 One company did report purchasing carbon capture offsets for compliance purposes but that is not the focus of this analysis.

21 Average weekly price from 14/10/22 to 31/03/23. Data sourced from Redshaw Advisors.

Figure 4: Breakdown of FTSE 350 2022 voluntary carbon offset purchases by project types by sector



Source: PwC analysis of CDP's 2022 Climate Change Questionnaire data

The choice of voluntary carbon offset project type varies by sector in the FTSE 350 (see Figure 4). For example, we find that the energy sector mostly purchases avoided deforestation offsets. Specifically, the energy sector accounts for over 95% of the total purchases of avoided deforestation offsets across all sectors. It also purchases significant amounts of renewable energy offsets. Nature restoration offsets, which include reforestation and afforestation projects, are the most popular offset project types amongst the financials and consumer staples sectors. In the industrial sector, the most popular options are projects which involve a mix of offsetting project types.

Our analysis shows that most sectors pay between £2 and £3.50 per tonne of CO₂e to offset their carbon emissions. Notably, the utilities sector pays less on average, paying below £1.50 per tonne of CO₂e offset. This is due to primarily purchasing non-CO₂ gases and renewable energy offsets, which are cheaper, reflecting the market discounting these offsets more heavily due to a greater challenge around their additionality. Despite purchasing significant amounts of avoided deforestation and renewable energy offsets, the energy sector is estimated to pay the highest price on average per tonne of CO₂e offset. Note that in our data we are unable to distinguish between the price of avoided deforestation offsets and the price of reforestation or afforestation offsets, which could lead to overestimation of the price paid for avoided deforestation offsets.

3. Summary of external price scenarios for the voluntary carbon market

Forecasting exact price levels for voluntary carbon offsets is challenging. This is due to a high degree of uncertainty around market conditions and potential regulatory or rule changes that are implemented as growing pressure is applied to businesses to transition to Net Zero. However, analysis by BloombergNEF²² outlines three potential scenarios for how voluntary carbon offset prices may evolve between now and 2050, depending on whether avoidance offsets continue to be accepted by carbon offset registries. Our analysis considers two of these scenarios.



Voluntary market scenario

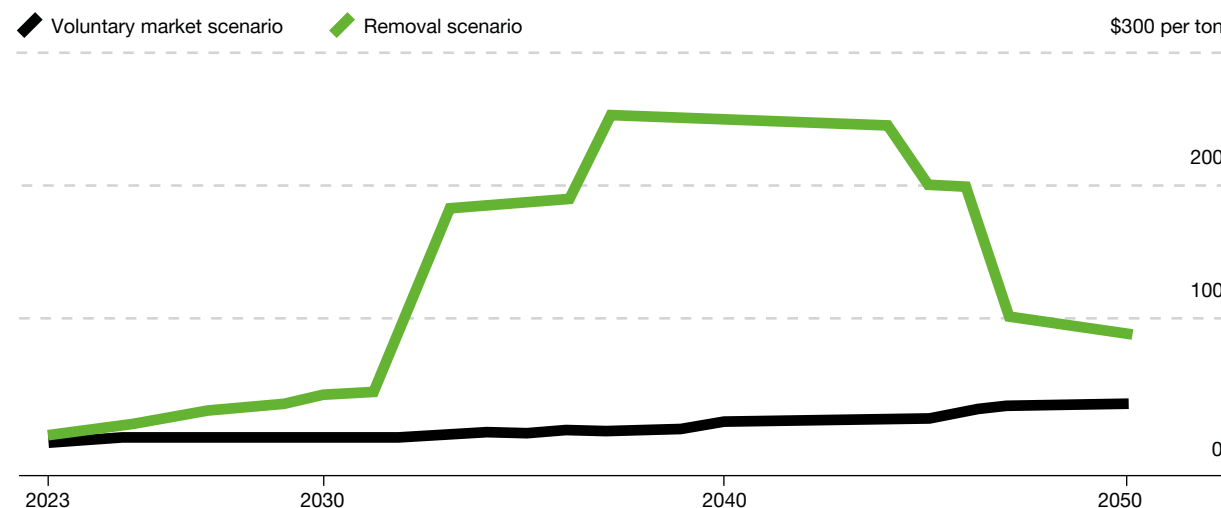
In the first scenario, no new restrictions are placed on the voluntary carbon offset market, and so the supply of lower-cost offsets continues to grow as avoidance offsets continue to be generated and accepted by the market. Increased demand from heavy-emitting businesses with sustainability goals combined with the glut of avoidance offsets leads to slow price growth over time, with prices hitting \$13/tCO₂e in 2030 and rising slowly to \$42/tCO₂e in 2050.



Removal scenario

In this scenario, only removal offsets that actually remove CO₂ from the atmosphere are accepted by carbon offset registries and so can contribute to businesses' Net Zero targets. Removal offsets are typically more expensive and are currently in much shorter supply than the lower-cost avoidance offsets. This shortage in supply leads to prices increasing to \$35/tCO₂e in 2030 before surging to \$254/tCO₂e in 2037.

Figure 5: Voluntary carbon offset prices under 2 scenarios



Source: BloombergNEF, 2023

Figure 6: Summary of external scenarios on forecasted price of voluntary carbon offsets

Scenario	Voluntary Market	Removal
Price in 2030, US\$/tCO ₂ e	\$13.00	\$35.00
Peak Price (Year), US\$/tCO ₂ e	\$42.00 (2050)	\$254.00 (2037)

²² BloombergNEF. Carbon Offset Market Could Reach \$1 Trillion With Right Rules. 2023. Available at: <https://about.bnef.com/blog/carbon-offset-market-could-reach-1-trillion-with-right-rules/>

4. Potential financial impact of future price rises of voluntary carbon offsets

The purpose of this report is not to analyse or model the changes in the volume of carbon offsets purchased over time. Rather it is to demonstrate the potential financial impacts of rising offset prices by expressing current purchasing volumes in terms of future prices, and to draw out the implications this could have for businesses and investors.

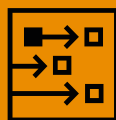
The external scenario prices in 2030 and at each scenario's 2030-2050 peak are applied to the current voluntary carbon offset purchases to give the potential future spending of each sector in the FTSE 350 on carbon offsets under these scenarios. For the voluntary market scenario, the peak year (between now and 2050) is 2050 whilst for the removal scenario the price peaks in 2037. The forecasted spending as an average proportion of each company's current gross profit is also reported on a sectoral basis. We describe our approach in more detail in the Technical Methodology in the Appendix of this report.

It is important to note that the volume of carbon offsets purchased by businesses will change between now and 2030 for a variety of reasons. Some businesses will currently not be purchasing voluntary offsets, but will start as a result of setting new Net Zero or other climate targets. Some businesses will be currently purchasing a small amount of voluntary offsets, but this will increase over time to cover residual emissions not previously offset, for example their Scope 3 emissions. In contrast, some businesses will currently be purchasing large volumes of offsets, but will reduce their purchases over time as they rapidly decrease their residual emissions under ambitious Net Zero targets. There may also be a response to negative public opinion towards offsets where businesses decide to reduce or stop purchasing offsets to avoid potential perceptions of greenwashing.



Impact on spending in 2030:

The total spending on voluntary carbon offsets across the FTSE 350 is estimated to increase from £38 million in 2022 to £135 million in the voluntary market scenario and £438 million in the removal scenario in 2030. This represents increases of 256% and 1,051%, respectively. This means that the cost of purchasing the current volume of carbon offsets would be more than 11 times higher under the removal scenario in less than a decade. Even under the more modest voluntary market scenario where the supply of cheaper offsets is allowed to proliferate, the cost of current purchases still more than triples.



Peak impact on spending:

In the pricing scenario's peak year, total spending on voluntary carbon offsets is estimated to further increase to £365 million under the voluntary market scenario and to £2,648 million under the removal scenario. The price increases and associated increases in spending pose significant risks to all sectors of the economy. This is equivalent to an increase in spending compared to 2022 of 859% under the voluntary market scenario and 6,862% under the removal scenario.

Figure 7: Cost of voluntary carbon offset purchases by sector by scenario in 2030 and at scenario peak

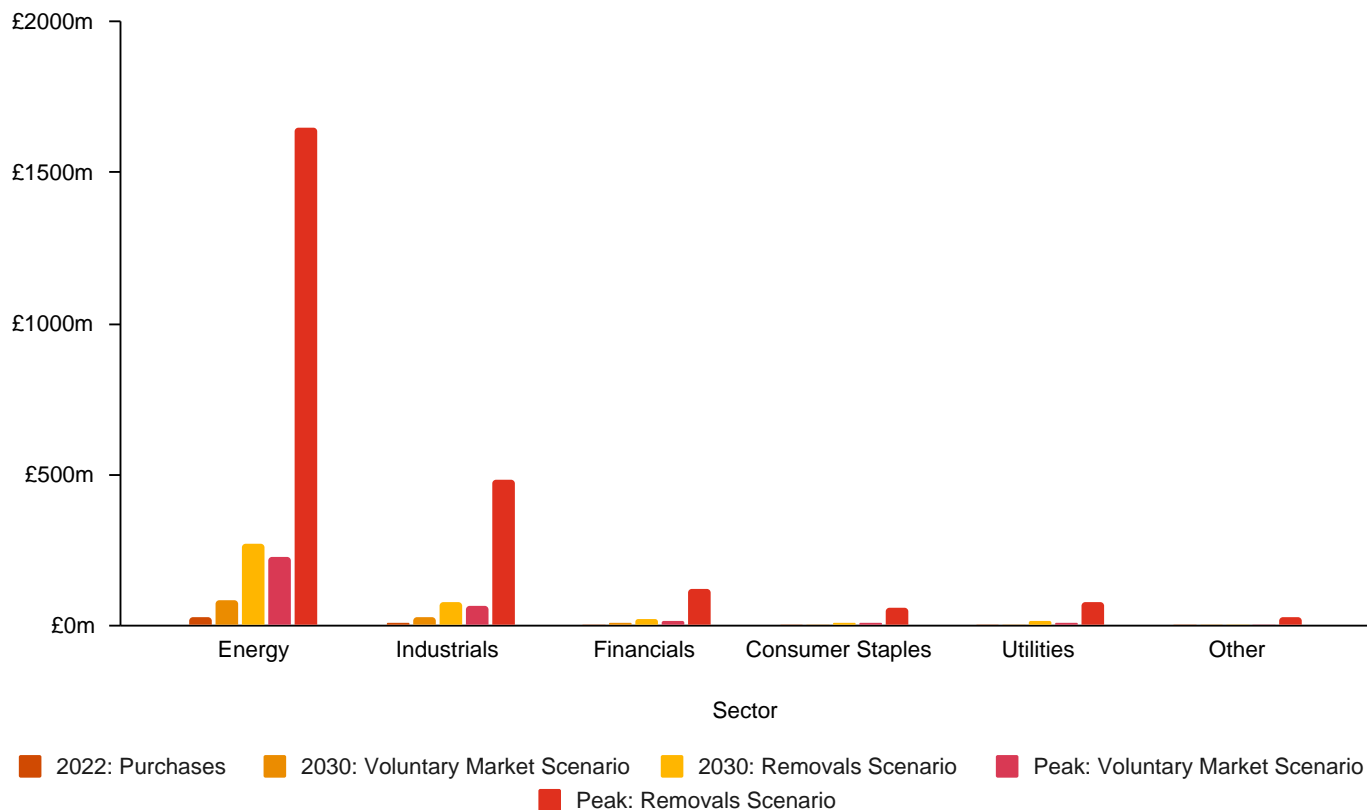
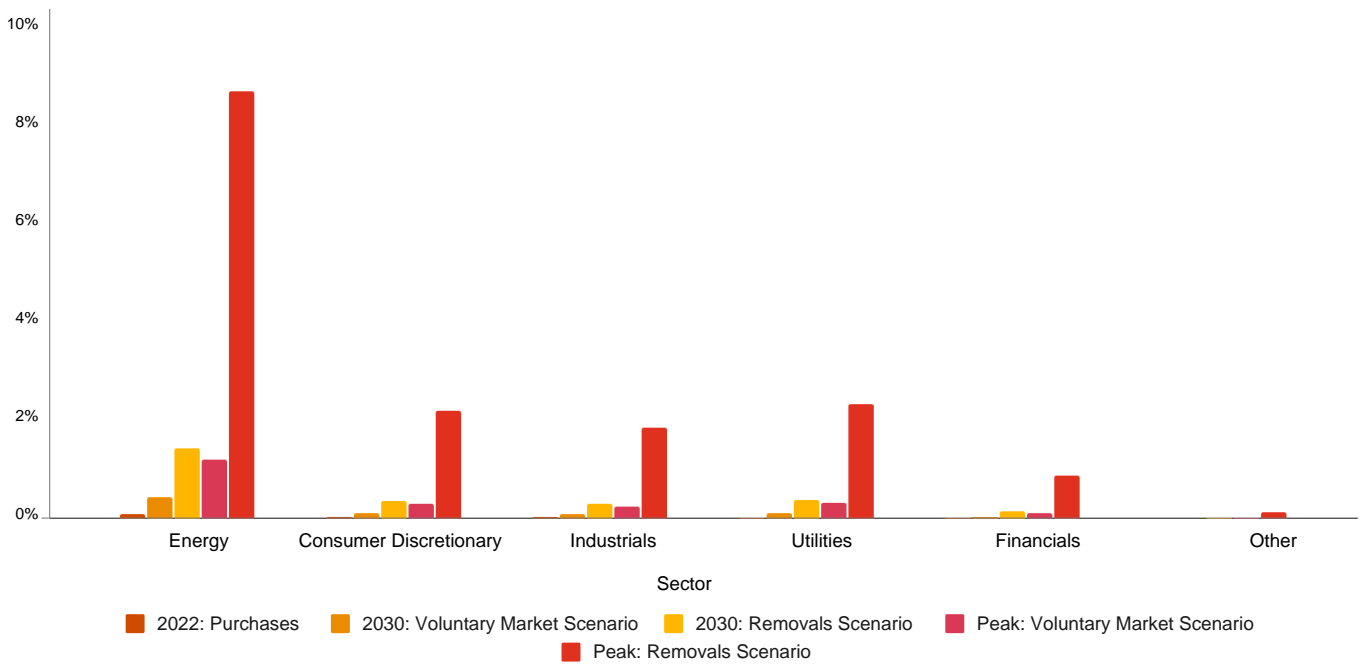


Figure 7 shows the cost of voluntary carbon offset purchases across each sector under the pricing scenarios in 2030 and in the scenarios’ peak year. By 2030, the total spending on voluntary carbon offsets in the energy sector is estimated to increase from £27 million currently to £93 million under the voluntary market scenario and to £299 million under the removal scenario. The estimated spending increases further if considered in the year where prices peak in each scenario. Under the voluntary market scenario, estimated spending in the energy sector increases to £249 million in 2050. Under the removal scenario, the estimated spending is estimated to peak at £1,809 million in 2037. The chart below shows what impact this increase in spending would have as a share of gross profit.

The industrial sector is the second largest purchasing sector of voluntary carbon offsets and is also impacted significantly by price increases. Under the voluntary market scenario, total spending in the sector is estimated to increase from £8 million in 2022 to £27 million in 2030 and £73 million in 2050. Under the removal scenario, this increase will be much more pronounced with spending reaching £88 million in 2030 and £533 million when voluntary carbon offset prices reach their peak in 2037.

Figure 8: Cost of voluntary carbon offset purchases as a share of 2022 gross profit by sector by scenario in 2030 and at scenario peak



For the energy sector, the average cost of offset purchases as a share of 2022 gross profit is estimated to rise to 0.4% under the voluntary market scenario and 1.4% under the removal scenario in 2030. At peak prices, this cost as a share of 2022 gross profit is estimated to rise further, increasing to 1.2% under the voluntary market scenario and 8.5% under the removal scenario. Under the removal scenario especially, this is a substantial proportion of profits to spend on voluntary carbon offsets. This may reduce the capacity of companies in the energy sector to invest in low-carbon technologies and reduces profit available to be distributed to investors as dividends. It is likely that a requirement to only purchase removal offsets would threaten any Net Zero plans relying on extensive use of voluntary carbon offsets.

The spending for consumer discretionary, industrials and utilities companies also rises to around 0.1% of 2022 gross profit on average under the voluntary market scenario in 2030 and up to 0.3% at its peak in 2050. Under the removal scenario, the spending across these sectors is estimated to increase to between 0.3% and 0.4% in 2030 and between 1.8% and 2.3% at its peak in 2037.



Price increases in the voluntary carbon market must be considered as part of companies' wider decarbonisation strategies. Carbon offsetting is often used to buy time to invest in the technologies and operational changes needed for full internal transformation. Significant increases in the price of carbon offsets will make buying time more expensive. This should drive investment into low-carbon technologies and operational changes sooner as they become more cost competitive, and could shift business spending away from offsets. Businesses should focus on reducing their emissions now rather than relying on voluntary carbon offsets in order to minimise their exposure to financial risks.

Disclosing approaches to offsetting and any considerations of changing price would improve transparency between businesses and investors and provide them with a better understanding of the risks or lack thereof from price rises in the voluntary carbon offset market. 118 companies of the FTSE 350 refer to carbon offsets in their annual or sustainability reports in 2022. Only 16% of these companies make reference to either the cost or price of these purchases and only 6% of the 118 discuss the potential for price rises.²³ Companies should make their voluntary carbon offset purchasing strategy clear and transparent for investors so they can assess the extent of potential risks from offset price rises. The Oxford Principles for Net Zero Aligned Carbon Offsetting²⁴ and the recommendations from the United Nations on how to use carbon offsetting to achieve Net Zero commitments can support businesses in improving their reporting.²⁵

²³ The methodology behind these figures is set out in detail in the appendix to this report.

²⁴ Allen et al. The Oxford Principles for Net Zero Aligned Carbon Offsetting. 2020. Available at: <https://www.smithschool.ox.ac.uk/sites/default/files/2022-01/Oxford-Offsetting-Principles-2020.pdf>

²⁵ UN. Net Zero Commitments by Businesses, Financial Institutions, Cities And Regions. 2022. Available at: https://www.un.org/sites/un2.un.org/files/high-level_expert_group_n7b.pdf

5. Conclusion and recommendations

Voluntary offset purchasing patterns vary substantially by company and sector in the FTSE 350. The energy sector in particular is purchasing substantial amounts of voluntary carbon offsets both in absolute terms and as share of gross profit. Under scenarios developed by BloombergNEF, the average prices for voluntary carbon offsets could rise significantly by 2030, especially if the type of carbon offsets that can be counted towards Net Zero plans is restricted. Under the removal scenario, where only carbon offsets that remove carbon from the atmosphere (as opposed to just avoiding potential emissions) are accepted, the cost of FTSE 350 voluntary carbon offset purchases could rise exponentially to just over £2.6 billion in 2037.

Due to the energy sector's high purchases of voluntary carbon offsets, it is the most exposed to these price rises and could see the cost of its purchases rise to £1.8 billion or 8.5% of its 2022 gross profit on average by 2037 under the removal scenario. The industries with the next highest voluntary carbon offset purchases in absolute terms are the industrials, financials and utilities sectors, with the consumer discretionary sector also spending the second highest amount on voluntary carbon offsets as a share of gross profit on average.

If the estimated increases in the cost of voluntary carbon offsets are borne out, a number of practical impacts will need to be considered by business including:

- Possible revision of Net Zero targets and timelines to deliver stated commitments;
- The need for sufficient cash provision to cover the increasing price of offset purchases, with additional internal resources devoted to monitoring market trends, prices and procurement activities where appropriate;
- The need to take a more sophisticated approach to risk management around carbon offset procurement, particularly the management of carbon offset price risk and the degree to which the business wishes to hedge against this;
- Adjustments to the risk/return profiles of hard-to-abate interventions, reducing the amount of residual emissions required to be offset and/or considerations of options to de-risk some of required decarbonisation technologies at an earlier stage; and
- The need to pass on carbon offset procurement costs to customers or, where this is difficult or impossible, incurring a reduction in earnings.

In addition, not considering potential future costs of offsets properly introduces the risk of companies leaving out these predicted price increases from their future looking models and climate impact scenarios. This means associated risks and opportunities may not be properly assessed or quantified, undermining the appropriateness of future investment and other strategic decisions.

Despite these risks, very few companies are disclosing clear and transparent purchasing strategies for voluntary carbon offsets. 118 companies of the FTSE 350 refer to carbon offsets in their annual or sustainability reports in 2022 but only 16% of these companies make reference to either the cost or price of these purchases and only 6% of the 118 discuss the potential for price rises. This means that investors cannot understand how exposed these companies are to the risks associated with rising voluntary carbon offset prices.

The recommendations for businesses purchasing voluntary carbon offsets as part of their decarbonisation strategy are as follows:

- Focus on decarbonisation now rather than in the long term, reducing exposure to potential price rises;
- Understand the approximate scale and profile of required carbon offset purchases and key sensitivities around these numbers;
- Carefully evaluate the most appropriate strategy for offset procurement, keeping in mind a “make or buy” mentality and establishing whether there may be ancillary benefits to developing high-quality offset projects internally, or through joint ventures, rather than entering into purchase agreements with third parties;
- Build optionality into carbon offset purchasing strategies (i.e. different asset classes and delivery dates for desired volumes) to reflect the likely evolution of the market in the coming years; and
- Disclose voluntary carbon offset purchasing strategies clearly in annual and sustainability reports (within limits of commercial sensitivities) to provide greater transparency and reassurance for investors and other stakeholders.



Appendix: Technical methodology

Appendix: Technical methodology



Estimating the impact of potential price rises

In order to calculate and analyse the impact of potential price rises on FTSE 350 companies, we gathered information and data on current purchasing and pricing of voluntary carbon offsets.



Pricing data

Pricing data from Redshaw Advisors are used to estimate the total current spending on FTSE 350 companies on voluntary carbon offsets.²⁶ The Redshaw Advisors pricing data are sourced from the AirCarbon Exchange and split by sub-contracts depending on the offset project type. The data are summarised in Figure 9. Weekly pricing data from Redshaw Advisors were collated over the period 14th October 2022 to 31st March 2023. Each week's pricing data, reported in US dollars, were converted to GBP using the exchange rate from each pricing date and the GBP prices were then averaged over this period. Prices are converted to GBP to facilitate comparisons with the companies' financial data.

The chart below shows the price of the different voluntary carbon contracts over the period defined. The Base Carbon Contract, made up of renewables and energy efficiency offsets is the cheapest offset type. The Forestry Carbon Contract is made up of agriculture, forestry and land use offsets. Notably, Carbon Capture contracts are significantly more expensive, fluctuating between £60 and £80.



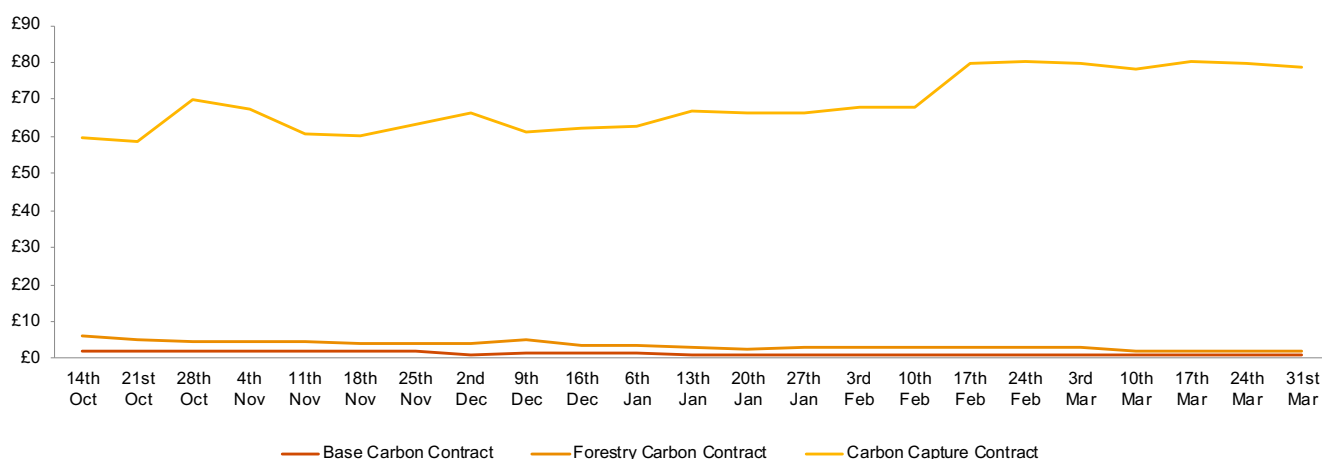
²⁶ Redshaw Advisors, WeeklyRed. Available at: <https://redshawadvisors.com/carbon-services/annual-weeklyred-subscription/>

Figure 9: Average price of voluntary carbon offsets by project type (14th October 2022 - 31st March 2023)

Contract/Sub-contract	Project type description	Average price (£)
Global Emissions Reduction (GER)	Comprised of the four sub-contracts	£3.16
Base Carbon	Renewables and energy efficiency	£1.40
Forestry Carbon	Agriculture, forestry and land use	£3.48
Prime Carbon	Credits achieving three Sustainable Development Goals	£2.89
Carbon Capture	Long-lived removals and EU Allowances	£66.84

As the carbon offset purchasing data are split by project type, the pricing data, also split by project type, are able to be applied to estimate the total spending on voluntary carbon offsets for each reporting FTSE 350 company. Data on actual purchase prices for specific carbon offsets are not available, so the total spending figure is an estimate using relevant, available data.

Figure 10: Weekly carbon offset contract prices over the period 14th October 2022 to 31st March 2023.



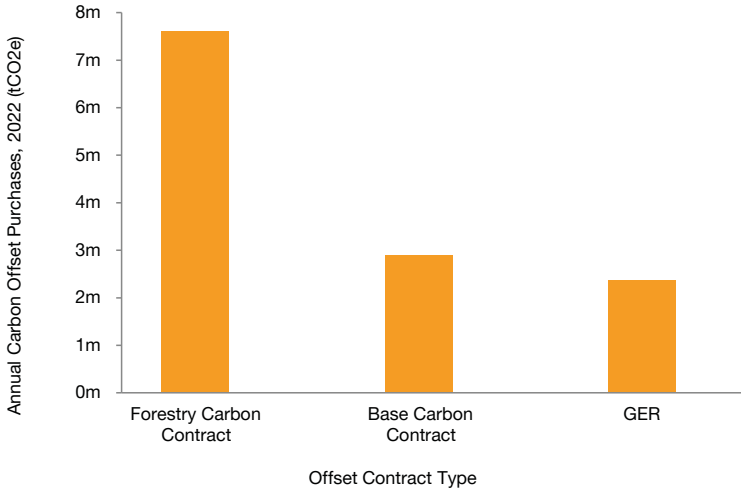
Source: Redshaw Advisors, Environmental Markets Monitor, 2022-2023

Purchasing data

The current purchasing data of carbon offsets were collated and provided by CDP. The data covered all FTSE 350 companies who had responded to CDP’s 2022 Climate Change Questionnaire (118/350). It includes the company, sector, whether or not the company purchased carbon offsets and, if so, the volume of offsets in tonnes of CO₂e emissions, and the type of offset (i.e. compliance or voluntary), as well as the offset project type (e.g. renewable energy, non-CO₂ gases). It is important to note that the results are only capturing the companies who are publicly reporting to CDP’s Climate Change Questionnaire in 2022.

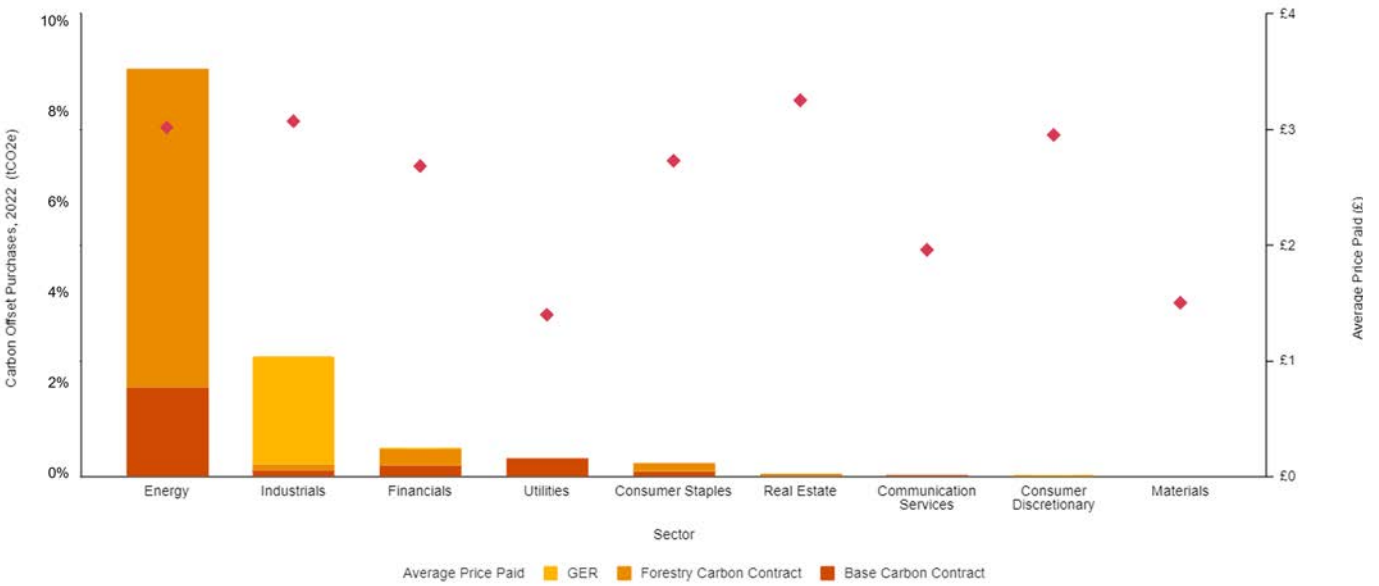
The purchasing data were mapped to a more aggregated offset project type to group relevant project types together. As part of this mapping, projects defined as forestry were mapped to either avoided deforestation or nature restoration to separate avoidance and removals forestry offset projects. The project types have also been mapped to the AirCarbon Exchange carbon contract types to allow for estimation of prices paid. In reality, the price each company pays per tonne of CO₂e offset will vary significantly by specific project and so the AirCarbon Exchange carbon contract type is only an approximation. However, the mapping should still reflect the broad difference in prices between avoided deforestation, carbon capture and other offset types.

Figure 11: 2022 voluntary carbon offset purchases by FTSE 350 companies publicly reporting to CDP by offset contract type



The chart across shows the total 2022 purchases of voluntary carbon offsets by reporting companies mapped to each contract type.²⁷ This chart shows that forestry carbon contracts are the most popular contract types that FTSE 350 companies purchase. This is followed by Base Carbon Contracts which includes energy efficiency and renewable projects and GER contracts which are made up of different types of offset project types. It is also noteworthy that no companies purchase voluntary carbon offsets mapped to carbon capture contracts.

Figure 12: 2022 voluntary carbon offset purchases by FTSE 350 sector by offset contract type



The energy sector purchases the most voluntary carbon offsets in absolute terms. In 2022, from the companies in each sector reporting to CDP, the energy sector purchased 8.8 million tonnes of CO₂e in voluntary carbon offsets, significantly higher than the industrial and financial sectors who were the next two largest, purchasing 2.6 million and 0.6 million tonnes of CO₂e in voluntary carbon offsets, respectively. Forestry-related carbon offsets (containing avoided deforestation, reforestation and afforestation project types) were the most popular contracts for the energy sector, whilst the industrial sector purchased more GER contracts, portfolios of varying types of offset project types.

The average price paid across the sectors varied from £1.40 in the Utilities sector to £3.25 in the Real Estate sector. The variation in the average price is indicative of the variation in the types of offset contracts different sectors are purchasing. However, the majority fall within the range of £1.80 and £3.50 per tonne of CO₂e offset.

²⁷ It is important to note that companies are not actually purchasing these contracts but rather their purchases have been mapped to these contracts. For example, where companies have reported purchasing single quantities of offsets which could be mapped to different project types (i.e. mixed), then the purchases are mapped to GER contracts.



Applying External Scenarios

In order to estimate the impact of potential price rises that companies are exposed to, we apply two external pricing scenarios to the current level of offset purchases.

The external pricing scenarios are based on BloombergNEF's forecasts of voluntary carbon offset pricing in different market environments.²⁸

Scenario 1

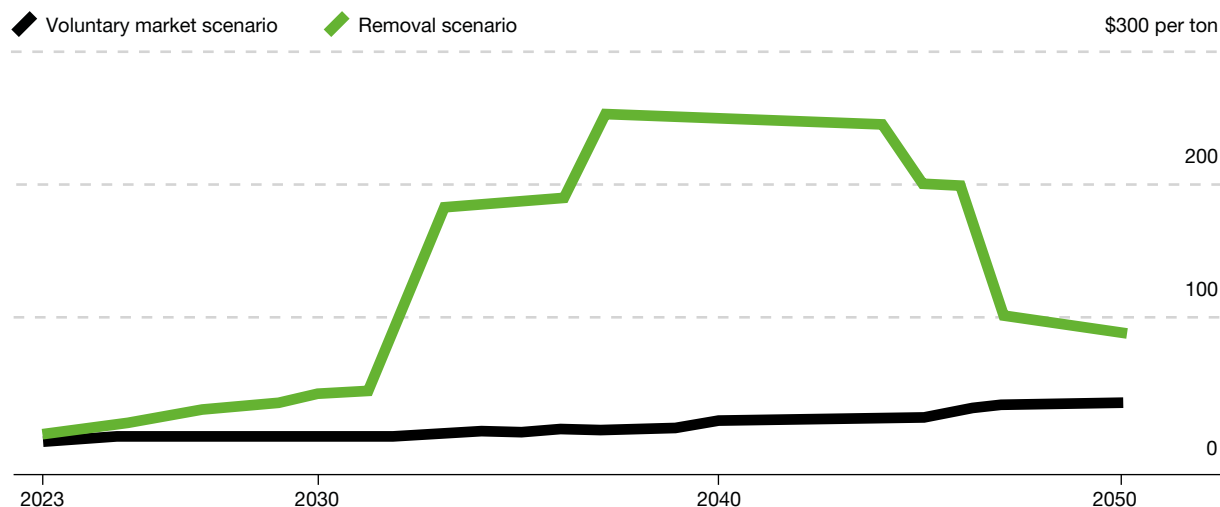
Voluntary market scenario: models the future price of carbon offsets in a market where the current oversupply of offsets continues and all types of offsets are permitted.

Scenario 2

Removal scenario: models the future price of carbon offsets in a market where avoidance offsets are no longer permitted and so supply is limited to removal offsets only, such as direct air capture and reforestation.

²⁸ BloombergNEF. Carbon Offset Market Could Reach \$1 Trillion With Right Rules. (2023). Available at: <https://about.bnef.com/blog/carbon-offset-market-could-reach-1-trillion-with-right-rules/>

Figure 13: Chart reproduced from BloombergNEF. Note chart shows forecasted prices, rather than actual prices.



Source: BloombergNEF, 2023

As shown in the chart, the forecasted prices change in trajectory over time. The time periods considered when looking at the potential risks of price rises are 2030 and the year in which prices peak in each of the scenarios; prices peak in 2050 in the voluntary market scenario and in 2037 in the removal scenario. We convert the prices quoted by BloombergNEF in USD into GBP using the exchange rate as of the publish date of the BloombergNEF research (23/01/23).²⁹

In applying the forecasted prices under the voluntary market, the new forecasted price in 2030 and 2050 is applied as a minimum price for all carbon offsets purchased. Consequently, any carbon offsets currently priced below the minimum price, for example renewables or avoided deforestation offsets, are increased in price to the forecasted level. Carbon capture offsets are currently priced above this level, and so under this price scenario are assumed to be unaffected by the forecasted minimum price.

The removal scenario is applying the forecasted price of removal offsets to all current purchases in 2030 and 2037 (peak year). Similar to the voluntary market scenario, carbon capture offsets are currently priced above the estimated 2030 price level and so are assumed to be unaffected by the forecasted minimum price.

In 2037, however, the forecasted price is above the current price of any offset project type and is therefore applied as the new price for all purchases. The implications of this are that all businesses will experience price increases... than businesses currently purchasing more expensive offsets.

The new price under each scenario in 2030 and 2037/2050 is applied to the relevant current purchases of carbon offsets to give the estimated spending of companies on carbon offsets in 2030 and the peak price year. This assumes that the volume of carbon offsets purchased between now and these time periods will remain constant. Whilst this is unlikely to be the case, the purpose of this report is not to analyse changes in the volume of carbon offsets purchased over time. The estimated spending in 2030 and in the year where prices peak in each scenario is then divided by the company's gross profit as of the last-twelve-months (LTM) from June 2022. This allows for the proportion of each company's current gross profit that is spent on voluntary carbon offsets in the 2030 and the peak price year to be estimated.

²⁹ Xe Exchange Rates, Historical Rates Tables, USD:GBP. Accessed on 23rd January 2023. Available at: <https://www.xe.com/currencytables/?from=GBP&date=2023-01-23#table-section>



Financial data

The financial data has been collated from S&P CapitalIQ. It includes data on revenue and gross profit for all FTSE 350 companies over the past year. The financial data used to estimate the current and future proportion of gross profit spent on carbon offsets are from LTM as of June 2022, meaning the impact of future price increases are presented in terms of the companies' current gross profit rather than in terms of a forecast of their future gross profit. The share of gross profit which is spent on carbon offsets is calculated for each company and then the average of these shares is calculated by sector. It is important to note that the average spending on voluntary carbon offsets as a proportion of gross profit by sector is not looking at the entire sector's average gross profit, rather the average gross profit of the companies that are reporting purchasing non-zero amounts of voluntary carbon offsets.

Scenario in 2030

The full breakdown of each sector's purchases of voluntary carbon offsets in absolute terms and as a share of gross profit for 2022 and 2030 across both scenarios is detailed below.

Figure 14: Cost of voluntary carbon offsets purchased by each sector and cost as a share of gross profit in 2022 and across the two scenarios in 2030

2030 Sector	2022: Purchases		2030: Voluntary market scenario		2030: Removal scenario	
	Cost, £m	Share of Gross Profit, %	Cost, £m	Share of Gross Profit, %	Cost, £m	Share of Gross Profit, %
Energy	26.59	0.09%	92.59	0.43%	299.15	1.40%
Industrials	7.97	0.03%	27.27	0.09%	88.10	0.30%
Financials	1.70	0.01%	6.65	0.04%	21.48	0.14%
Consumer staples	0.82	0.00%	3.15	0.02%	10.16	0.05%
Utilities	0.56	0.02%	4.22	0.12%	13.63	0.38%
Real estate	0.17	0.00%	0.56	0.01%	1.80	0.04%
Consumer discretionary	0.09	0.03%	0.34	0.11%	1.09	0.35%
Communication services	0.08	0.00%	0.41	0.01%	1.33	0.02%
Materials	0.03	0.00%	0.23	0.00%	0.76	0.00%
Information technology	0.02	0.00%	0.09	0.00%	0.29	0.02%
Health care	0.01	0.00%	0.03	0.00%	0.11	0.00%

Scenario at peak:

The absolute purchases of carbon offsets and the purchases as a share of gross profit across the two scenarios is broken down for all sectors below.

Figure 15: Cost of voluntary carbon offsets purchased by each sector and cost as a share of gross profit across the two scenarios at peak

Sector	2022: Purchases		2050: Voluntary market scenario		2037: Removal scenario	
	Cost, £m	Share of Gross Profit, %	Cost, £m	Share of Gross Profit, %	Cost, £m	Share of Gross Profit, %
Energy	26.59	0.09%	249.29	1.17%	1,809.16	8.48%
Industrials	7.97	0.03%	73.42	0.25%	532.79	1.81%
Financials	1.70	0.01%	17.90	0.12%	129.91	0.86%
Consumer staples	0.82	0.00%	8.47	0.04%	61.46	0.29%
Utilities	0.56	0.02%	11.36	0.31%	82.42	2.27%
Real estate	0.17	0.00%	1.50	0.03%	10.87	0.24%
Consumer discretionary	0.09	0.03%	0.91	0.30%	6.58	2.14%
Communication services	0.08	0.00%	1.11	0.01%	8.05	0.11%
Materials	0.03	0.00%	0.63	0.00%	4.57	0.01%
Information technology	0.02	0.00%	0.24	0.01%	1.74	0.09%
Health care	0.01	0.00%	0.09	0.00%	0.66	0.00%

Corporate disclosure of carbon offsets

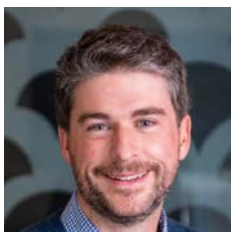
In order to measure the extent of corporate disclosure of carbon offsets across the FTSE 350, we searched for key terms related to carbon offsets in companies' FY22 annual and sustainability reports. Our analysis defines the composition of the FTSE 350 as it was as of 1st January 2023. The annual report and sustainability report were chosen as they act as key sources of information and communication between a company and its shareholders with regards to both the company's financial and operational outlook, as well as providing an indication of the company's progress against its climate-related targets. Consequently, they are most likely to make reference to purchasing strategies of voluntary carbon offsets and the navigation of potential pricing risks. It is important to note that some companies may be reporting their voluntary carbon offsets through other forms of corporate communication, and so the results are unlikely to cover every mention of carbon offsetting by all companies.

Below is a list of the key search terms that were investigated as part of this analysis:

- Carbon offset(s) & price
- Carbon offset(s) & cost
- Carbon offsetting & price
- Carbon offsetting & cost
- Emissions offset(s) & price
- Emissions offset(s) & cost
- Emissions offsetting & price
- Emissions offsetting & cost
- Carbon credit(s) & price
- Carbon credit(s) & cost
- Voluntary & carbon & price
- Voluntary & carbon & cost

The number of hits returned for each search was recorded and the details of the hits were investigated to confirm that the results were relevant in the context of voluntary carbon offset purchasing strategies.

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