

MILLIMAN REPORT

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Voluntary Carbon Markets: Opportunities, challenges and the role of insurers

December 2023

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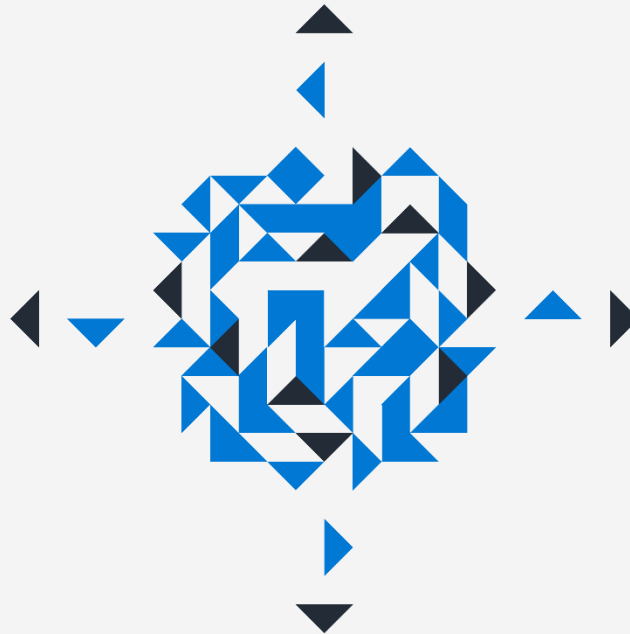


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1. Background

Investors, primarily, are concerned with potential returns from investments and the risk-reward balance offered. However, more recently concerns related to environmental considerations, partly due to climate disclosure requirements, have become more significant. Within these considerations the Voluntary Carbon Markets (VCMs) are gaining increasing attention due to their potential role in facilitating the global transition to net-zero. In this paper we explore the evolving landscape of VCMs and their potential relevance to the insurance industry.

The development of VCMs has enabled the trading of carbon credits on a voluntary basis between willing buyers and sellers. The buyers may be seeking to offset their own carbon emissions in pursuit of corporate ambitions to reduce their carbon footprint or meet net-zero targets. The sellers are seeking finance and compensation for the development and implementation of projects that reduce carbon emissions or sequester it in some way from the atmosphere, e.g., carbon capture and storage technologies or regenerative agricultural projects. Such projects can generate a stream over time of carbon credits that may then be traded on a VCM.

While projects must include an element of carbon reduction or sequestration to generate carbon credits, it is important to recognise that this is not the only benefit sought in many cases. Thus, while carbon credits and VCMs have the potential to be useful in securing and channelling finance to projects, the measure can be too narrow and an imperfect proxy for the environmental outcomes of a project. Thus, we will follow with interest the development of other potentially complementary measures such as biodiversity net-gain credits.

Turning to life insurers, as our target audience, we are aware that as a source of patient long-term finance for the real economy there is a significant level of investment that already takes place in illiquid assets for some sections of the life insurance market. Given this and the ongoing development of VCMs, it feels natural to ask how, when and where insurers might eventually become involved.

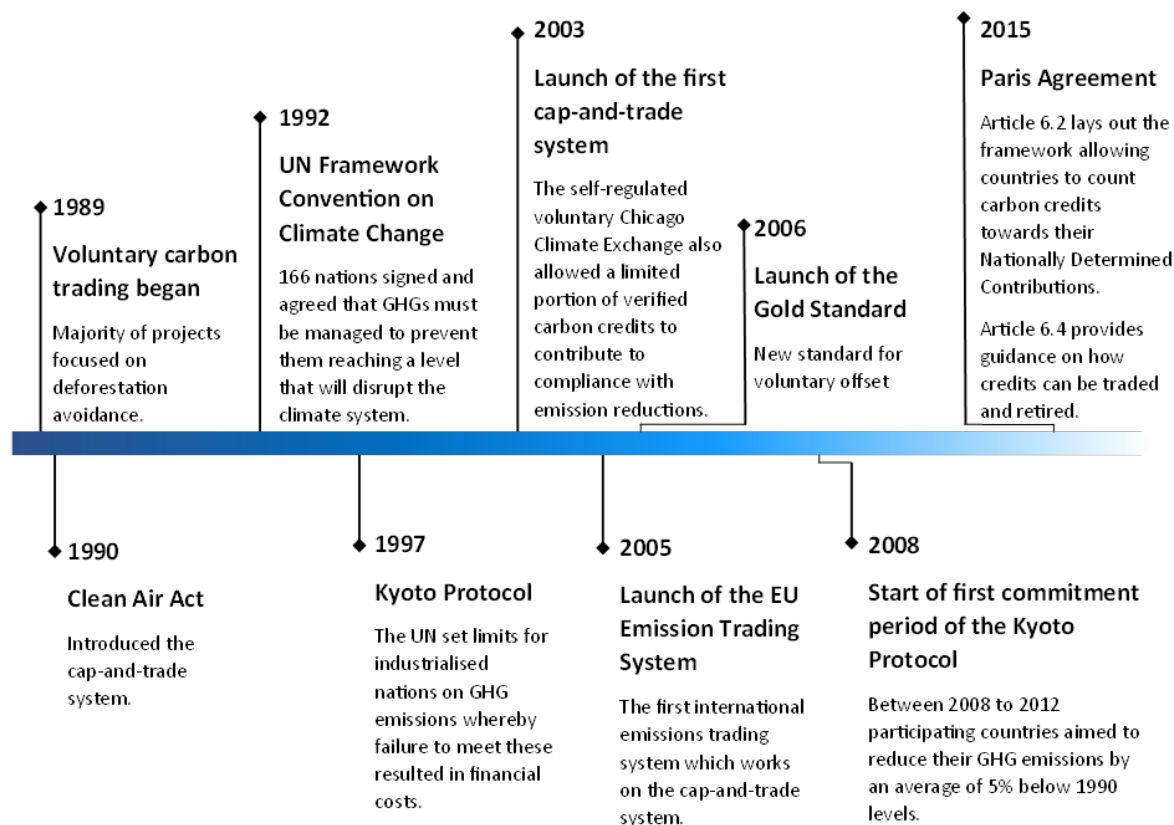
The remainder of this paper is structured as follows:

- **Introduction:** Provides a brief summary of the history and key features of VCMs, explains some terminology and lays out the key current challenges facing them. A huge volume of material is already available on VCMs and for the reader interested in digging deeper we include some references at the end of the paper.
- **VCMs and life insurers:** Explores the typical structure of projects that may generate carbon-credits for trading on VCMs and considers the possible role(s) that life insurers might play. In particular, we also consider the role of life insurers as potential investors. In this section we share insights from several conversations we have had already with insurers on this topic.
- **Looking ahead:** Finally, we consider the future for VCMs and revisit the challenges that must be successfully addressed if their development is to progress significantly.

2. Introduction

Figure 1 provides an overview of the timeline of significant events in the historical development of carbon markets.

FIGURE 1: KEY EVENTS IN THE DEVELOPMENT OF CARBON MARKETS



In 1989, voluntary carbon trading began, primarily focussed on projects that aimed to prevent deforestation.¹ However, a significant shift occurred in 1997 with the introduction of the United Nation's Kyoto Protocols,² which required industrialised nations to reduce their emissions, set limits on carbon emissions and impose penalties for noncompliance. These protocols helped formalise carbon trading as part of a global effort to reduce greenhouse gas (GHG) emissions. In response, Compliance Carbon Markets (CCMs) were developed, which enabled companies, whose activities were within their scope, to trade any surplus emission allowances³ with those who had exceeded their own allowable emissions.

The establishment of the CCMs influenced the progression of the earlier voluntary carbon trading activities. As such, alongside the CCMs the voluntary markets also began to evolve, somewhat independently, but influencing each other over time.

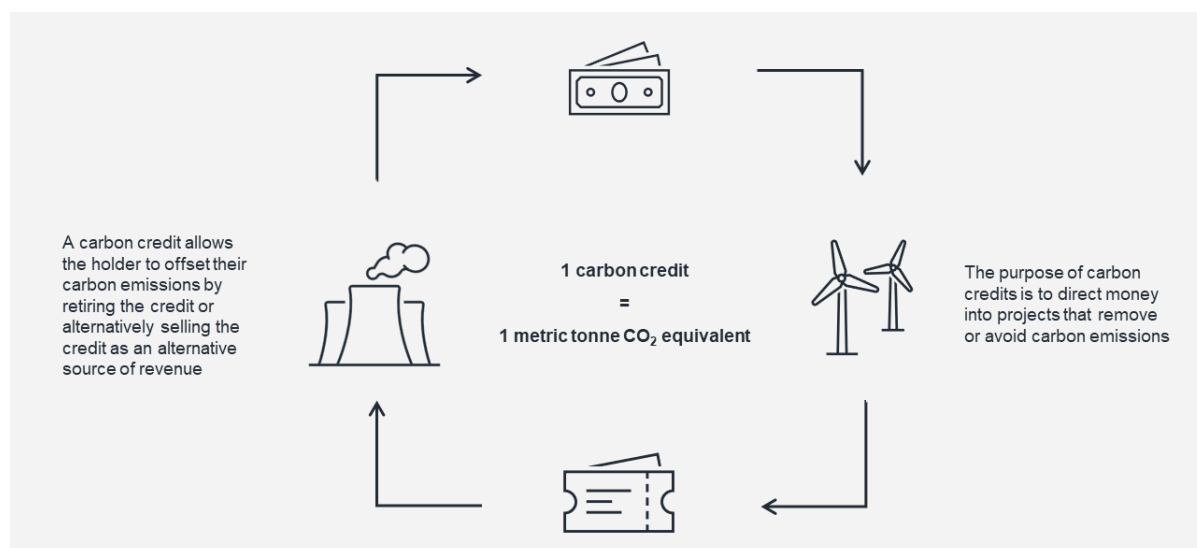
1 Taskforce on Scaling Voluntary Carbon Markets (January 2021). Final Report. Retrieved 19 November 2023 from https://www.iif.com/Portals/1/Files/TSVCM_Report.pdf.

2 United Nations (10 December 1997). Kyoto Protocol to the United Nations Framework Convention on Climate Change. Retrieved 19 November 2023 from <https://unfccc.int/documents/2409>.

3 Surplus allowances arise where a company's permitted emissions during a period exceed its actual emissions.

As their name suggests, the voluntary markets enable voluntary participation in carbon offsetting and sequestration activities, where trading is undertaken through the use of carbon credits. One carbon credit is equivalent to one metric tonne of CO₂ (tCO₂e). Other GHGs can also be traded on the VCMs using equivalency factors, but for simplicity this paper focusses on carbon, or CO₂, offsetting. Projects that offset CO₂ aim to limit the release of future GHG emissions to the atmosphere, such as renewable energy projects. Projects that sequester CO₂ aim to reduce current levels of CO₂ in the atmosphere, such as reforestation projects. Projects that are designed to store carbon more permanently with a low risk of reversal, for example storing carbon in a stable and solid form through mineralisation, also fall under the latter category.

FIGURE 2: WHAT IS A CARBON CREDIT?



In most cases a carbon credit is created only after it has been verified that the required amount of CO₂ has either been reduced or sequestered by a specified project. The verification step is crucial to the integrity of carbon markets, as it ensures that the emissions reductions or carbon removals claimed by a project are real and can be used for carbon offset purposes. However, there are projects that sell carbon credits based on future emission reductions or carbon removals. These projects are typically structured as forward contracts and commit the project owner to delivering a specified quantity of carbon credits at a future date, contingent on the project successfully achieving the anticipated emission reductions or carbon removals.

As such, carbon credits are not all equal. The quality of a carbon credit is determined by several key factors, which collectively ensure that the credit represents genuine and meaningful emissions reductions or carbon removals. Therefore, the degree of risk linked to a specific carbon credit also varies and the following factors should be considered:

Additionality

Additionality is fundamental to the creation of carbon credits. For a carbon removal project to be used as an offset to emissions, the carbon that is sequestered or removed needs to be in addition to what would have been removed in the absence of the project. Without additionality the VCMs would not be contributing to the global transition to net-zero. The need to demonstrate additionality is the reason why verification is so important to the VCMs.

Verification

As described above, verification is another key factor in the integrity of the carbon markets. This consists of independent assessment of carbon offsetting or removal projects and is an important step in quality assurance of the VCMs and ensuring additionality. Besides additionality, verification also seeks to address emission reduction claims and accounting, project documentation, compliance with standards where they exist and double-counting issues.

Companies could open themselves up to reputational risk from verification challenges, particularly if at a later stage doubt arises about the additionality of a particular VCM project.

Permanence

Permanence relates to the long-term sustainability of carbon removal or avoidance projects and ensuring that the effect of these projects will not be reversed over time. For example, a forest fire may result in destruction of a reforestation project, which would release previously sequestered carbon back into the atmosphere. Most projects establish buffer reserves⁴ to counter any potential future reversals of emissions and high-quality credits may include measures to mitigate the risk of reversal.

Leakage

Leakage is typically said to occur when the generation of carbon emissions is not actually reduced but rather simply relocated from one country to another. This can be driven by emitters seeking to take advantage of lower carbon prices in a particular territory or under less stringent regulation.

Carbon pricing

In addition to the risks associated with the carbon credits themselves, investors in the VCMs also need to consider risks related to the pricing of carbon credits:

1. Like all markets, the VCMs can be affected by supply and demand, which can lead to price fluctuations. Therefore, prices may not always reflect the true cost of emission reductions or carbon removals, and speculative trading can add to volatility.
2. The prices of carbon credits can also vary significantly depending on the quality of the credits, or even location and whether the credits are on the VCMs or CCMs (see Figure 3).
3. There is a lack of a global unified standard for the VCMs, which results in varying quality and consistency across VCM projects. Currently, credits that have been verified by more highly regarded standards attract a higher price. This creates the risk of carbon prices potentially changing as underlying standards change, or even becoming obsolete as standards unify or one global standard is established.

FIGURE 3: EXAMPLE CARBON PRICES FROM CARBONCREDITS.COM ON 21ST NOVEMBER 2023⁵

EXAMPLE CARBON PRICES			
Compliance Markets	Last	Change	YTD
European Union	€ 77.11	-0.12%	-3.61%
United Kingdom	£41.66	-0.79%	-43.13%
California, United States	\$29.45	-	+1.31%
Australia	\$30.75	2.07%	-9.02%
New Zealand	\$70.85	+0.85%	-7.29%
South Korea	\$6.91	-6.49%	-44.19%
China	\$10.19	+0.07%	+25.47%
Voluntary Markets	Last	Change	YTD
Aviation Industry Offset	\$0.58	-31.76%	-84.90%
Nature Based Offset	\$0.97	-20.49%	-78.91%
Technology Based Offset	\$0.58	-28.40%	-49.12%

4 For example, see: <https://www.offsetguide.org/high-quality-offsets/permanence/how-carbon-offset-programs-address-permanence/>.

5 See <https://carboncredits.com/carbon-prices-today/>.

WOODLAND CARBON CODE

An example of a scheme whose attributes have resulted in higher carbon prices for covered projects:

“The Woodland Carbon Code (WCC) is the quality assurance standard for woodland creation projects in the UK, and generates high integrity, independently verified carbon units. Backed by the Government, the forest industry and carbon market experts, the Code provides woodland carbon units right here in the UK. The Woodland Carbon Code is internationally recognised for high standards of sustainable forest management and carbon management and is endorsed by ICROA, the global umbrella body for carbon reduction and offset providers in the voluntary market. Woodland Carbon Code projects provide social and environmental benefits for many communities across the UK. These include biodiversity and habitat creation, improvements in health and wellbeing, benefits for farming, local employment, and educational opportunities.”

Prices for a Pending Issuance Unit, effectively a “promise to deliver” a woodland carbon unit in future, based on predicted sequestration, are noted as between £10 and £20/tCO_{2e}.

Source: <https://woodlandcarboncode.org.uk/>

2.1 REGULATION

In its 2021 report on scaling voluntary carbon markets,⁶ the Taskforce on Scaling Voluntary Carbon Markets (TSVCM)⁷ points out that the necessary regulatory frameworks required for scalable VCMs are still nascent and could benefit from increased coordination and support. In the United Kingdom (UK). This is supported by the fact that neither the Financial Conduct Authority (FCA)⁸ nor the Bank of England (BoE) have yet published consultations or guidelines regarding VCMs.

Nonetheless, the 2022 consultation of the London Stock Exchange Group (LSEG) to establish a VCM designation in its Admission and Disclosure Standards⁹ sets out a useful framework to understand what a mature regulatory framework could look like. This is reflected in Schedule 8 of the updated Admission and Disclosure Standards published in October 2022 (see 7) London Stock Exchange Group, 2022 in References).

Funds and operating companies would be required to comply with guidelines and standards that are aimed at addressing legitimate concerns about additionality, permanence and leakage. The LSEG's standards and regulatory guidelines are designed to address the nature of the carbon-generating projects and the expected carbon credit yield as well as additional requirements that may set expectations to meet specific environmental and social benefits as seen in the summary in Figure 4.

FIGURE 4: A SUMMARY OF LSEG'S PROPOSED FRAMEWORK FOR REGULATING VCMS

LOW-CARBON TRANSITION ELIGIBILITY STANDARDS
<ul style="list-style-type: none"> ▪ A standardised and reliable classification system for qualified carbon generating green funds, projects and companies. ▪ The FTSE Russell's Green Revenues Classification System is a good example which also provides regular tracking and reporting processes to ensure compliance with the classification standards.
CARBON CREDIT QUALITY STANDARDS
<ul style="list-style-type: none"> ▪ Utilising an independent governance body to establish an accreditation programme that sets out best practice in GHG emissions reduction and offsetting through the use of high-quality carbon credits. ▪ Ensuring that the representation within the governance structures includes experts in carbon market technologies, sustainable finance, environmental Non-governmental Organization (eNGOs), United Nations Framework Convention on Climate Change (UNFCCC) process expertise, regulatory affairs, the corporate sector, science and academia, local communities and indigenous people. ▪ Some well established examples are the Integrity Council for the Voluntary Carbon Market (ICVCM) and the International Carbon Reduction & Offset Alliance (ICROA).
ONGOING TRANSPARENCY FRAMEWORKS
<ul style="list-style-type: none"> ▪ Market Abuse oversight that requires regular submissions to the regulator such as the order book data. ▪ Setting out and providing on key project milestones. ▪ Regular assessments of the actual vs expected target yield of Carbon Credits. ▪ Providing general status updates of investments into qualifying projects.

⁶ Taskforce on Scaling Voluntary Carbon Markets (January 2021), Final Report, op cit.

⁷ Taskforce on Scaling Voluntary Carbon Markets. About Us. Retrieved 19 November 2023 from <https://www.iif.com/tsvcm>. “[A] private sector-led initiative working to scale an effective and efficient voluntary carbon market to help meet the goals of the Paris Agreement.”

⁸ FCA (19 April 2016). About the FCA. Retrieved 19 November 2023 from <https://www.fca.org.uk/about/what-we-do/the-fca>. The FCA is the UK's financial markets regulator responsible for standard setting, prudential supervision and conduct regulation.

⁹ LSEG (10 October 2022). Admission and Disclosure Standards. Retrieved 19 November 2023 from https://docs.londonstockexchange.com/sites/default/files/documents/attachment_2_to_n1922.pdf. This document sets out the rules and responsibilities in relation to a company's admission to trading and ongoing disclosure obligations for companies seeking admission, or already admitted, to trading on the London Stock Exchange's markets along with additional requirements for designations.

2.2 EXAMPLES OF VCM PROJECTS

VCM projects broadly fall into two categories, Carbon capture and storage (CCS) projects and nature-based solution (NBS) projects.

Carbon capture and storage (CCS) projects

Carbon capture utilisation and storage (CCUS) projects involve the use of solvents that bind to CO₂ molecules, enabling them to be removed from industrial emissions, e.g., the exhaust gases from a gas or coal-fired power station where the concentration of CO₂ is significant. The captured CO₂ can either then be stored, typically underground, or utilised for example in the production of plastics or biofuel.

Direct air capture (DAC) projects operate on similar lines but seek to remove CO₂ that is already within the atmosphere and must therefore contend with much lower CO₂ concentrations.

CCS projects can produce their own emissions depending on the project type so calculating the cost of CCS projects should be based on the CO₂ avoided.¹⁰ Much of the cost for these types of projects tends to be up-front due to the research and development required, indicating that relatively high future carbon prices may be required for viability at scale.

Some examples of CCS projects are:

- **Drax power station (Yorkshire, UK):** In July 2022, plans were announced to develop the world's largest carbon capture facility at Drax. Work may start as early as next year, and once operational the facility is expected to capture over 8 million tonnes of CO₂ each year.¹¹
- **Northern Lights Project (Norway):** The Northern Lights Project is a major CCUS initiative in Norway that aims to establish a transportation and storage system for CO₂ emissions from various industrial sources in Northern Europe. The captured CO₂ will be transported and stored in geological formations beneath the North Sea.
- **Climeworks (various locations):** Climeworks is a Swiss company that has developed modular DAC technology. It has DAC facilities in various locations, including Switzerland, Iceland and Italy. These facilities capture CO₂ from the atmosphere and can be used for carbon removal and utilisation.

Currently these projects make up a small percentage of the market.¹²

Nature-based solution (NBS) projects

Nature-based removal or avoidance projects represent almost 45% of the VCM.¹³ These projects aim to protect the natural environment and promote biodiversity as a means to reduce the amount of CO₂ in the atmosphere.

Some examples of NBS project types include:

- Restoration or expansion of carbon sinks such as peat bogs and salt marshes, which are natural habitats that capture CO₂ from the atmosphere.
- Improving forest management (IFM): IFM initiatives aim to transition forests to be more sustainable and resilient to the impacts of climate change. Forest management activities increase the carbon stock within the forest as well as reduce GHG emissions from forestry activities when compared to business-as-usual forestry practices.
- Afforestation, reforestation, revegetation (ARR): Afforestation is the creation of a new forest where there was not one before. Reforestation is the process of planting trees in a forest where the number of trees has been decreasing whereas revegetation focusses on replanting and rebuilding the soil of disturbed land.

10 Cameron, L. et al. (7 September 2023). Why the Cost of Carbon Capture and Storage Remains Persistently High. International Institute for Sustainable Development. Retrieved 19 November 2023 from [https://www.iisd.org/articles/deep-dive/why-carbon-capture-storage-cost-remains-high#:~:text=Carbon%20capture%20and%20storage%20\(CCS,tCO2%20for%20diluted%20gas%20streams](https://www.iisd.org/articles/deep-dive/why-carbon-capture-storage-cost-remains-high#:~:text=Carbon%20capture%20and%20storage%20(CCS,tCO2%20for%20diluted%20gas%20streams).

11 Drax (12 July 2022). Drax submits plans to build world's largest carbon capture and storage project. Retrieved 19 November 2023 from https://www.drax.com/press_release/drax-submits-plans-to-build-worlds-largest-carbon-capture-and-storage-project/.

12 Sylvera (18 May 2022). What carbon projects has Sylvera rated? Retrieved 19 November 2023 from <https://www.sylvera.com/blog/carbon-projects-rated-by-sylvera>.

13 Cameron, L. et al. (7 September 2023), op cit.

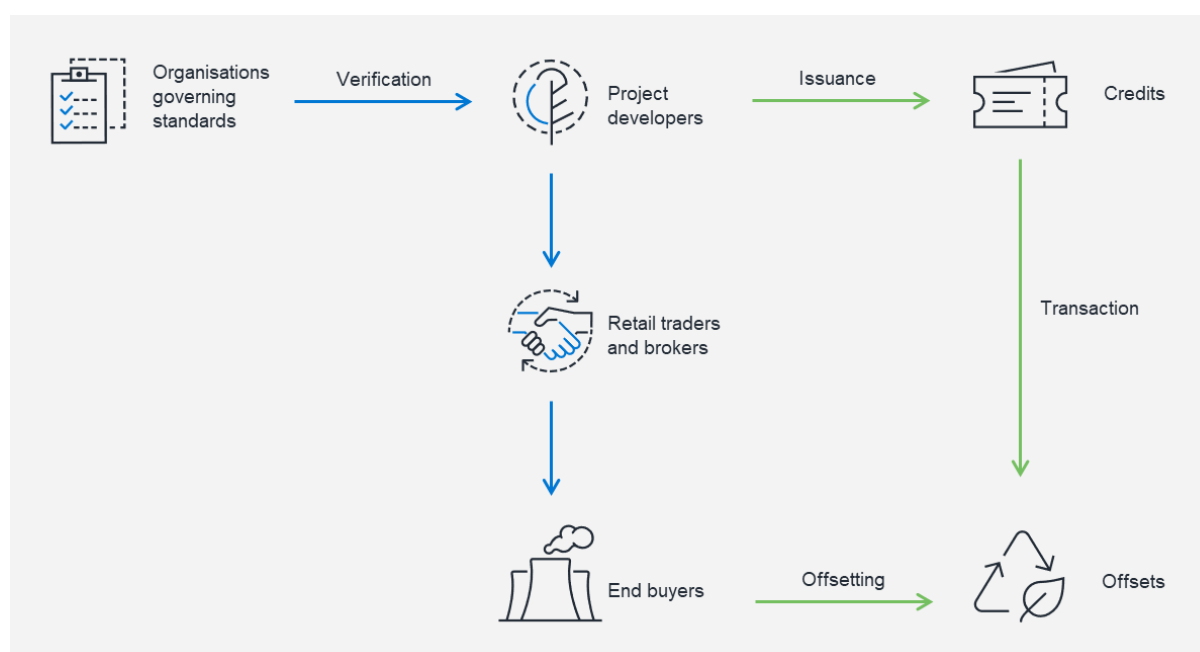
- **Regenerative agriculture:** Aims to restore and enhance soil health by rebuilding soil organic matter and increasing soil biology to improve water retention, pest resilience, carbon sequestration and yields. The approach typically involves minimal soil disturbance (“no till”), keeping soils covered with diverse species (cover crops) and integrating livestock as a natural source of organic matter.
- **Blue carbon projects** aim to protect coastal ecosystems, such as mangroves, which sequester five times more CO₂ than terrestrial trees.

Projects such as these are lower cost as they already exist at scale. In addition to generating credits, nature-based projects provide co-benefits, specifically biodiversity conservation and improving climate change resilience (e.g., prevention of coastal erosion or reducing flood risk).¹⁴

3. How can VCM be of interest to insurers?

Having provided a brief introduction to carbon markets and some of the terminology in the previous section, we now concentrate on the question of whether VCMs and the projects facilitated by them might be of interest to insurers.

FIGURE 5: MAIN PARTICIPANTS IN THE VOLUNTARY CARBON MARKET



From Figure 5, we can see there are several key players in the VCMs:

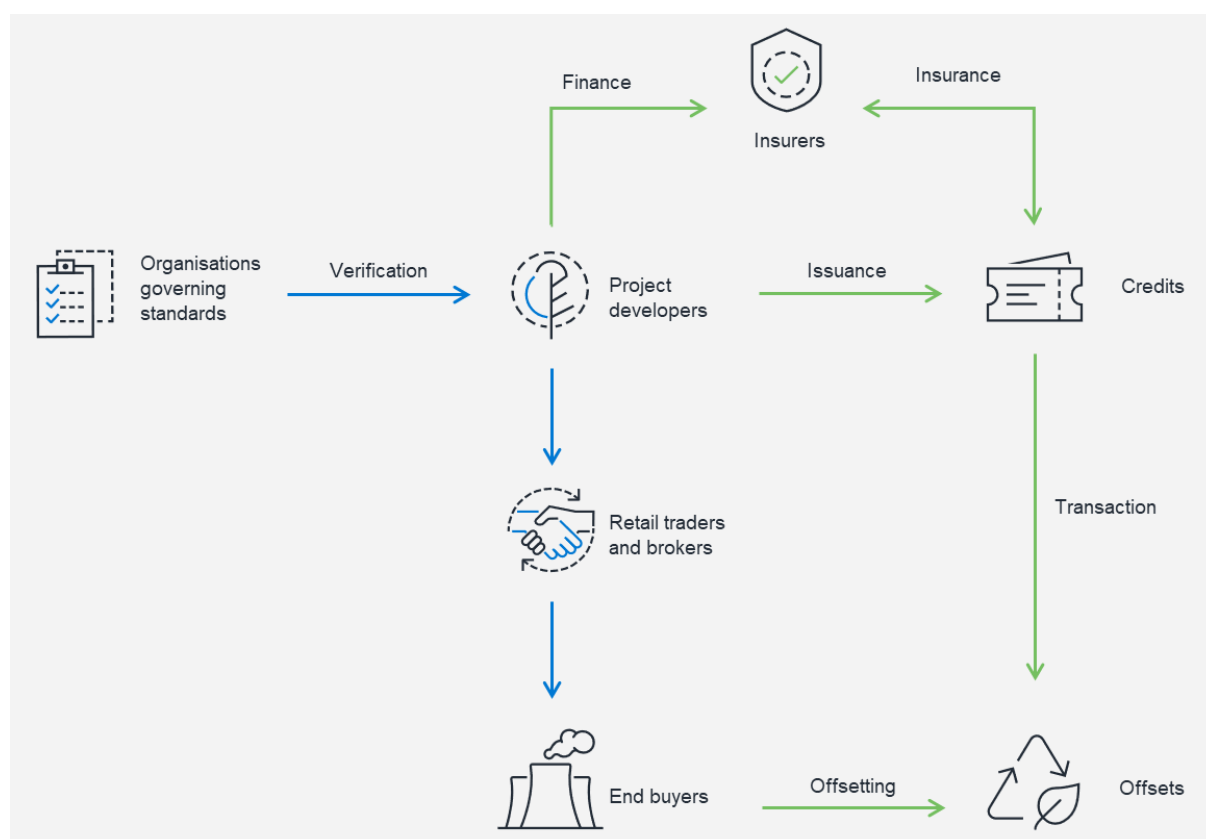
- **Project developers:** Organisations facilitating the design, financing, marketing, oversight and delivery of projects generating a stream of verifiable carbon credits.
- **Organisations governing standards:** Project developers will engage with organisations such as Sylvera, BeZero or Calyx to ensure robust verification of project deliverables supporting marketing and ultimately buyer confidence.
- **End buyers:** Typically, firms seeking to purchase carbon credits to offset their own emissions, helping them achieve their own targets. Ideally, of course, this should be done only after all reasonable steps have been taken (or are being taken) to create a direct reduction in the firm’s emissions. Indeed, we understand anecdotally that some developers will not engage with buyers where this is not demonstrably the case.
- **Retail traders and brokers:** Aim to bring together projects (supply) and end buyers (demand) as in other markets. As well as connecting project developers with end buyers, retail traders and brokers provide various other services relating to VCMs, including market insight, sourcing projects that align to buyers’ preferences, supporting negotiations between buyers and sellers and carbon credit portfolio management.

¹⁴ Climate Impact Partners. Nature-Based Solutions. Retrieved 19 November 2023 from <https://www.climateimpact.com/explore-projects/nature-based-solutions-projects/>.

We expect that the most likely areas of involvement for insurers are:

1. In providing services to support project developers: For example, finance or tailored insurance to mitigate project risks. Given that many projects will be relatively long-term, and the asset created by providing finance likely to be very illiquid in nature, the financing role thus appears to fit most naturally with life insurers, and particularly those with long-term and illiquid liabilities. On the other hand, the mitigation of project risks—for example that woodland planted to sequester carbon subsequently burns down, rereleasing the carbon into the atmosphere—aligns with the types of risk that general insurers may be very well placed to assess and provide cover for.
2. As project developers: It is possible insurers, most likely life insurers, could take on the role of project developer, effectively creating the asset rather than simply financing an asset created by someone else. Some life insurers, particularly those active in the bulk purchase annuity market, already do this in some cases and so may be well placed to leverage existing skills and experience into this area.
3. As end buyers of carbon credits: Insurers may also act as end buyers of carbon credits offered in VCMs in order to achieve their own corporate net-zero goals. In this regard, the role of insurers is not different from that of other commercial firms and consequently we do not explore this role for insurers further in this paper.

FIGURE 6: MAIN PARTICIPANTS IN THE VOLUNTARY CARBON MARKET WITH SUPPORT FROM THE INSURANCE INDUSTRY



We now discuss the potential involvement of insurers in the first two roles in more detail.

3.1 SUPPORTING PROJECT DEVELOPERS

Providing finance

As noted earlier, life insurers may play a role as investors, providing finance to project developers. In some regards, the nature of many projects appears a good fit for life insurers:

- **Long-term:** Many life insurers have relatively long-term liabilities associated with pension savings and payout annuity business and so have a natural appetite for similarly long-term assets to match them.
- **Illiquid:** Assets arising from financing VCM projects related to reducing carbon emissions or sequestering carbon from the atmosphere are likely to be bespoke, with terms and conditions agreed directly between the lender and borrower to suit each particular project. The assets will not be standardised or traded on a public market and an investor wishing to sell an asset early may find it difficult or impossible to do so at least without a significant price penalty—in short, these assets will be illiquid.
- This degree of illiquidity will undoubtedly be an obstacle for some investors, but life insurance liabilities exhibit a spectrum of liquidity from highly liquid unit-linked business with no exit penalties to highly illiquid payout annuities. Thus, life insurers with significant illiquid liabilities can still find such illiquid assets attractive.
- **Specialised:** The individual nature of the assets along with the lack of standardised terms and conditions and lack of third-party assessments of creditworthiness (e.g., credit ratings provided by rating agencies such as Fitch, Moodys and Standard & Poors) means these investments will require extensive expertise covering both initial appraisal and ongoing monitoring and management. Again, life insurers are relatively well placed, with many having large in-house investment teams and existing experience in illiquid assets such as infrastructure debt and commercial real estate loans.

However, having spoken to several insurers, it is clear that there are many hurdles that will need to be overcome if life insurers are to become active investors.

Firstly, the view was expressed that it was important to understand, as early as possible, how the VCM market will realistically scale over time as there is little point committing significant resources to build out the necessary contacts and expertise if the prospects are for only a very limited flow of high-quality projects. It was also clear that VCM projects will need to be competitive, offering attractive risk-adjusted returns in comparison with alternative investments.

Where the revenue from a project arises substantially in the form of carbon credits, the volume and value of these credits determines the security of the insurer's investment.

This first challenge arises in relation to volume. While the future volume of credits can be estimated in advance, it will not be known until the project is implemented and periodic measurement and verification work undertaken to confirm the volume of credits that can be issued in each future period. Parallels may be drawn with usage-based infrastructure projects, for example a toll road, where vehicle volumes are not necessarily known in advance either. However, it seems fair to say that uncertainty in the up-front assessment is likely to be higher for many VCM projects given the lack of accepted market practices around measurement and verification. This aspect seems particularly acute for nature-based projects due to the technical difficulties of establishing a common and robust baseline from which to measure subsequent incremental carbon sequestration. This increases the risk for the potential investor, though some mitigation could be achieved via heavy over-collateralisation, i.e., taking a very conservative view of future credit generation.

Another challenge to consider is that the revenue stream is initially generated in the form of carbon credits. The insurer's asset (debt instrument) may be structured in traditional form, with coupons payable in monetary terms. Nevertheless, the security of those coupons still relies on the future price at which carbon credits can be translated into the required fiat currency, e.g., GBP or USD. This means that, even where a UK insurer invests in a UK project, the revenue stream is still effectively denominated in a foreign currency and subject to exchange rate risk. Earlier in this paper we observed that this risk is nontrivial, with prices for some carbon projects exhibiting significant volatility. Drawing on experience from more traditional infrastructure projects, this risk might be mitigated using an offtake agreement. Subject to these being available for VCM projects, a third party would then agree to purchase a number of the future credits at a fixed price, increasing revenue certainty for an investor. The drawbacks are increased complexity and costs and the introduction of exposure to the credit risk of the organisation acting as the offtaker.

An alternative approach would be for the insurer to receive compensation in-specie (directly in the form of carbon credits) and then retire these credits to reduce its own hard-to-abate emissions. This approach avoids the need to exchange the credits into fiat currency. However, our sense is that there will be limited appetite for this approach, as insurers do not tend to be heavy carbon emitters and thus demand for credits to act as offsets is likely to be low. Furthermore, this approach represents a corporate investment by the insurer, and it does not create an asset that can be used to back policyholder liabilities.

Where insurers invest in illiquid assets to back illiquid liabilities such as payout annuities, buy-and-hold investment strategies still require assets that deliver predictable future cash flows that can then be used to match similarly predictable liability outgo. Indeed, regulatory regimes such as Solvency II have very strict requirements around cash flow matching, where insurers seek to apply the Matching Adjustment and take some up-front credit for part of the excess return (illiquidity premium) available from illiquid assets. Even where VCM project assets provide fixed monetary coupons, insurers will still need to assign an internal credit rating to the asset and, given the particular uncertainties noted above, insurers will need to consider whether their existing internal rating frameworks and methodologies can be applied or whether extensions or modifications are needed. Insurers will also need to contemplate how likely it is that, once assessed, such assets will achieve an investment-grade rating. To be clear, allocation of a sub-investment-grade credit rating does not preclude investment, but we note that typically insurers have a limited appetite for sub-investment-grade assets and so this will certainly constrain demand.

In light of the significant hurdles around the inclusion of VCM project assets within a Matching Adjustment portfolio, it is worth considering whether insurers may be better able to deploy these assets elsewhere. It is certainly the case that there is increasing interest in the use of illiquid assets more generally as a route to providing both potentially enhanced returns and increased portfolio diversification. Small allocations to illiquid assets are therefore being contemplated for a wider range of insurance liabilities such as long-term pensions savings contracts. A recent development in the UK in July 2023 was the announcement by the Chancellor of the Exchequer of the Mansion House Reforms. These reforms included the following announcement:

“Today I am pleased to announce that the Lord Mayor and I joined the CEOs of many of our largest DC pension schemes—namely Aviva, Scottish Widows, L&G, Aegon, Phoenix, Nest, Smart Pension, M&G & Mercer—for the formal signing of the ‘Mansion House Compact.’

The Compact—which is a great personal triumph for the Lord Mayor—commits these DC funds, which represent around two-thirds of the UK’s entire DC workplace market, to the objective of allocating at least 5% of their default funds to unlisted equities by 2030.”¹⁵

Other comments we noted from our conversations with insurers reflected ongoing concerns around reputational risk and a general sense that the development of clear and consistent regulation and common standards needs to catch up before insurers will be sufficiently confident to participate.

Overall, the general sentiment expressed by the insurers we have spoken to is that while the challenges can be overcome it feels like there is a great deal of work still needed and the commitment of the necessary time and effort must be clearly justified. Not surprisingly, many felt there were currently higher priorities and were taking a “wait-and-see” approach.

Mitigating project risks

VCM projects will inevitably be exposed to a range of risks with the potential to adversely impact project performance and consequently the flow of future carbon credits or even the integrity of existing credits. Reforestation projects are an example where fire damage to the woodland will:

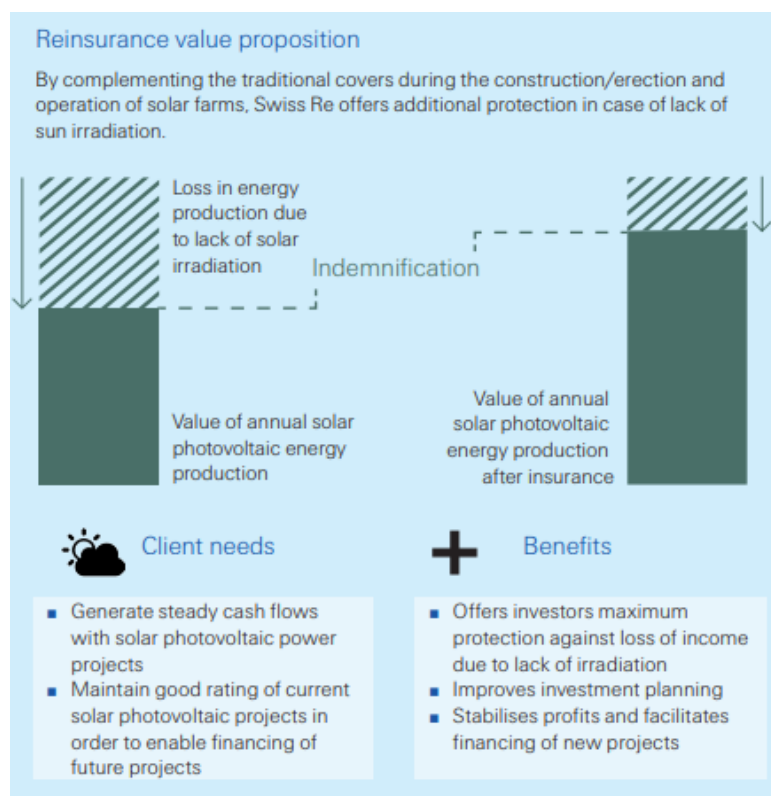
- Cease carbon sequestration in the impacted area, stopping or at least reducing the generation of additional carbon credits.
- Release previously sequestered carbon back into the atmosphere, calling into question the value of credits already generated and utilised.

¹⁵ HM Treasury (10 July 2023). Chancellor Jeremy Hunt’s Mansion House speech. Retrieved 19 November 2023 from <https://www.gov.uk/government/speeches/chancellor-jeremy-hunts-mansion-house-speech>.

Similar risks pertain to technological solutions such as carbon capture and storage (CCS), where equipment could fail or run at below expected efficiency and, where captured carbon is stored, e.g., in underground geological chambers, there is always the possibility of leakage through fissures.

We note that some insurers already provide covers for some more traditional infrastructure project risks. Swiss Re and Munich Re both currently offer products in the renewable energy space, in particular covering solar panels. The Swiss Re product provides “protection against the loss of income due to lack of solar irradiation ... of a given solar farm” aimed at solar farm operators and investors. While Munich Re has developed a photovoltaic warranty product for manufacturers and investors. Both products aim to provide protection against the potential loss of renewable energy production in the future.





FIGURE 7: SWISS RE REINSURANCE VALUE PROPOSITION ON LOSS OF PHOTOVOLTAIC ENERGY PRODUCTION OF A SOLAR FARM¹⁶



We note that assessing the risks within VCM projects is likely to be complex. Nevertheless, the skills and expertise required align well with the capabilities of the general insurance sector to price and manage these types of risks. General insurers should therefore be able to offer insurance covers to project developers that mitigate some of the project risks and may provide a more attractive risk-return profile overall. Indeed, the industry is already moving in this direction, for example a paper produced in 2021 by Aon included the following illustration of some areas where insurance risk transfer could help mitigate the risks of VCM projects:

¹⁶ Swiss Re. Protection Against Lack of Solar Irradiation. Retrieved 19 November 2023 from https://www.swissre.com/dam/jcr:d0a96a96-cf03-4e54-8681-fb921e8bfc1f/protection_against_lack_of_solar_irradiation.pdf.

FIGURE 8: INSURANCE SOLUTIONS TO HELP REDUCE RISKS IN CARBON OFFSET TRANSACTIONS¹⁷

 Property	 Environmental Liability	 Political Risk	 Technology Performance
<p>Property insurance can help protect against physical losses to assets that are meant to generate carbon offsets. For example, natural disasters and pest infestations can damage or destroy forests, wetlands, and mangroves. Coverage for project developers can include ecosystem restoration costs and carbon revenue loss protection for specified events.</p>	<p>Implementing carbon offset projects may result in negative environmental impacts. For example, planting non-native tree species may negatively impact freshwater availability.</p>	<p>Given the changing political landscape and instability in some of the project host countries, insurance can help protect clients against invalidation, seizure, and other political and regulatory risks arising from government actors. Crime coverage can help protect against illegal logging.</p>	<p>Bespoke technology systems performance insurance solutions can leverage the engineering know-how, risk analytics and (re)insurance in case a carbon capture project underperforms expectations, leading to the delay of non-delivery of carbon offset credits.</p>

Taking a very long-term view, there are potentially additional benefits to insurance companies from supporting the transition to a low-carbon future if these projects ultimately help to reduce the risk of significant hard-to-predict insured losses, e.g., from shifting weather patterns.

4. Looking ahead

4.1 MARKET POTENTIAL

Overview

Over the past two to three years, the VCMs have faced headwinds similar to the wider global capital markets due to the emergence of several systemic events whose rate of occurrence has left little room for recovery. Events such as the COVID-19 pandemic that led to unprecedented sudden drops in the global gross domestic product (GDP) and the recent geopolitical uncertainties with the conflicts in Ukraine, and more recently Palestine, that have resulted in high and unstable energy prices, have led to volatile investment markets, record inflation numbers and subsequently an increase in the cost of capital due to rising interest rates. Given that investors would naturally reconsider their allocations of capital to nontraditional asset classes such as VCM projects, these headwinds have had a disproportionate effect on VCMs in the short term.

Nevertheless, given the direction of travel around the transition of our energy systems and the growing interest in solutions that mitigate risks to nature, the longer-term case for VCM projects remains strong subject to the challenges around them being adequately addressed.

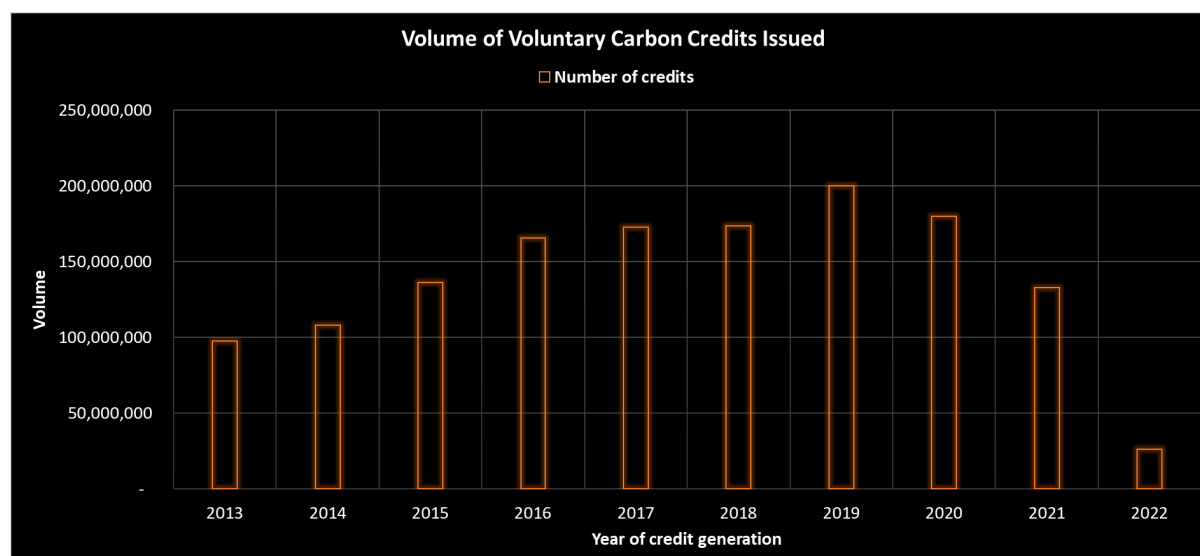
Global historical volume

Over the last 10 years, there has been increased interest in the role of carbon markets as companies seek to fulfil their climate commitments, particularly net-zero goals. This interest can be observed by analysing the historical volume of voluntary carbon credits (VCCs), as seen in Figure 9, using one of the largest voluntary registry offsets databases that is maintained by the Berkeley Carbon Trading Project.¹⁸

¹⁷ Aon (2021). Utilizing Insurance Solutions to Help Reduce Risks in Carbon Offset Transactions. Retrieved 19 November 2023 from <https://www.aon.com/getmedia/93d4160b-6ee5-4041-9c16-01c041daafb5/aon-carbon-offset-insurance-solutions-brochure.pdf>.

¹⁸ The Berkeley Carbon Trading Project is part of the Goldman School of Public Policy, a graduate school at the University of California, Berkeley. See <https://gspp.berkeley.edu/research-and-impact/centers/cepp/projects/berkeley-carbon-trading-project/offsets-database>.

FIGURE 9: VOLUME OF VOLUNTARY CARBON CREDITS ISSUED



Source: Ivy S. So, Barbara K. Haya, Micah Elias. (2023, May). Voluntary Registry Offsets Database v8, Berkeley Carbon Trading Project, University of California, Berkeley. Retrieved from: <https://gspp.berkeley.edu/faculty-and-impact/centers/cepp/projects/berkeley-carbon-trading-project/offsets-database>

Over the period covered in Figure 9, a striking feature is the marked decline in the volume of carbon credits registered in 2022 compared with all the prior years. This setback may be linked to the broader economic and geopolitical uncertainties already noted, though there are also drivers more specific to VCMs, as the risks and challenges we have discussed (with further details provided in the next section) now appear to be weighing more heavily on sentiment and thus appetite to participate, with negative implications for both supply and demand. This recent trend is discussed in several more recent articles, for example:

A briefing note from Bain & Company released on 13 February 2023¹⁹ noted:

“Carbon markets are at an inflection point: Either the uncertainties will be resolved through cooperation by participants and regulators, leading to yet more growth, or markets will become bogged down by poor alignment and confusion.”

And also that:

“Market participants are under greater public scrutiny, and many have been accused of ‘greenwashing’ for promoting their use of carbon credits. The market complexities and lack of transparency in projects creates a difficult risk for corporates across industries from energy and airlines to chemicals and consumer goods.”

Further, a Wall Street Journal article from 30 October 2023²⁰ noted:

“A growing number of sceptics say the math behind carbon credits is squishy and that the projects don’t do as much good for the climate as they report. Environmentalists are accusing companies of using credits to avoid the hard work of trimming emissions on their own, sometimes bringing lawsuits against those, such as Delta Air Lines, with big offset claims. Credit sales and prices have collapsed this year.”

19 Denig, B. et al. (13 February 2023). Voluntary Carbon Markets in 2023: A Bumpy Road Behind, Crossroads Ahead. Bain & Company. Retrieved 20 November 2023 from <https://www.bain.com/insights/voluntary-carbon-markets-in-2023-a-bumpy-road-behind-crossroads-ahead/>.

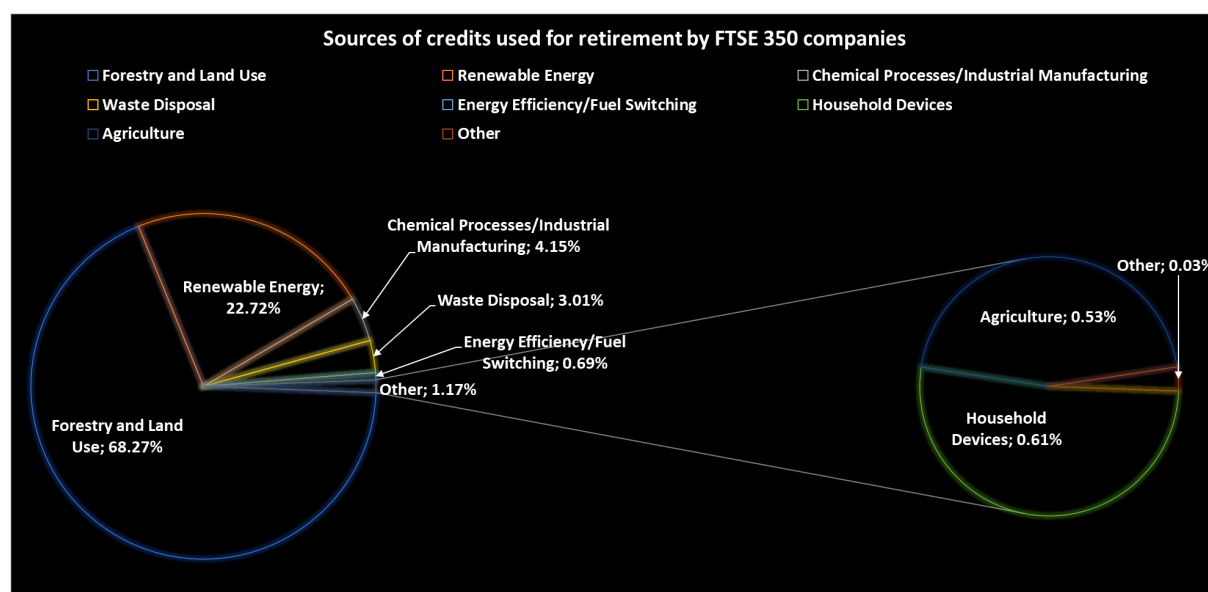
20 Dvorak, P. (30 October 2023). He Pioneered Carbon Offsets to Save Tropical Forests. Now the Market Is Collapsing. Wall Street Journal. Retrieved 20 November 2023 from https://www.wsj.com/science/environment/he-pioneered-carbon-offsets-to-save-tropical-forests-now-the-market-is-collapsing-18a5bc54#comments_sector.

Voluntary carbon credit uptake by UK companies

Within the years 2013 to 2022, approximately £97 million worth of VCCs have been retired by some of the top 350 companies by free float market capitalisation listed on the London Stock Exchange (LSE) i.e., the Financial Times-Stock Exchange 350 (FTSE 350).²¹

Looking at the last 10 years, the most prominent projects that have generated VCCs retired by FTSE 350 companies are forestry and land use projects, at approximately 68%, followed by renewable energy projects at about 23% as seen in Figure 10.

FIGURE 10: SUPPLY AND DEMAND IN THE UK VOLUNTARY CARBON MARKET



Source: Milliman analysis using data from Allied Offsets' Report (commissioned by the Climate Change Committee).²²

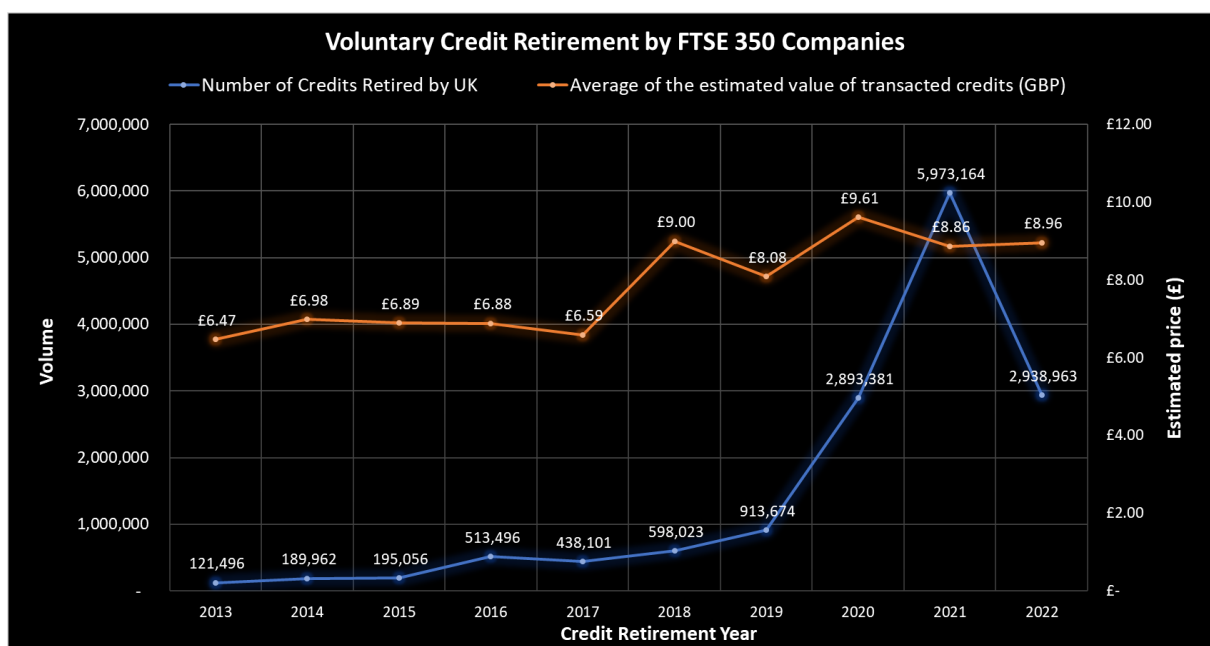
The implied preference for land use and the energy production sectors are expected given their significant contribution to the carbon life cycle. The other projects that form a much smaller proportion of the VCCs retired reflect the evolving body of research and innovation as the complexities inherent within the carbon cycle processes are increasingly understood over time.

Figure 11 summarises the aggregate volume of the retired VCCs by FTSE 350 companies within the last 10 years.

21 Allied Offsets (July 2022). Supply and Demand in the UK Voluntary Carbon Market. Retrieved 20 November 2023 from <https://www.theccc.org.uk/wp-content/uploads/2022/10/Supply-and-Demand-in-the-UK-Voluntary-Carbon-Market-Allied-Offsets.pdf>.

22 Allied Offsets (July 2022). Supply and Demand in the UK Voluntary Carbon Market. Retrieved 20 November 2023 from <https://www.theccc.org.uk/wp-content/uploads/2022/10/Estimates-of-UK-company-offset-demand-Research-Questions-1a-2b-and-2c.xlsx>.

FIGURE 11: AVERAGE PRICE OF TRANSACTED CREDITS AND VOLUME OF CREDITS RETIRED IN THE UK VOLUNTARY CARBON MARKET



Source: Milliman analysis using data from Allied Offsets' Report (commissioned by the Climate Change Committee).²²

As can be seen from Figure 11, the volume of VCCs retired has been steadily increasing over the last 10 years, with two sharp increases in 2020 and 2021, followed by a significant decline in 2022. While the source and coverage for Figure 11 and the earlier Figure 9 are different, and so not directly comparable, we note the general pattern of growth followed by recent steep decline is consistent across both.

Future VCM market scale

The relevance of carbon markets mainly relies on the objective of cutting global GHG emissions, as many VCM projects are aligned with satisfying offsetting, reduction and removal needs. Therefore, assessing the potential future scale of VCMs involves estimating both the future demand for such projects and the likely pipeline of supply. Both of those estimates will inevitably be subject to material uncertainty, for example:

- **Demand:** Demand will be influenced by the scale of GHG emission reductions targeted, which will in turn be influenced by the balance of efforts between mitigation and adaptation alongside the evolution of government policies that may tilt the playing field in particular directions and also impact the time profile of demand. Beyond that, demand will also be influenced by the evolution of regulation and standards for VCM markets, which should deliver benefits in terms of increased confidence for investors but also potentially hinder innovation if this becomes overbearing and excessively costly.
- **Supply:** Supply is inevitably linked to demand but faces its own drivers in relation to the cost and availability of inputs of energy and raw materials—batteries, wind turbines and solar panels require significant quantities of minerals in their production and of land for their deployment. Some applications require the development of supporting infrastructure such as the enhancement of the electricity grid. The economic outlook will influence the appetite for investment and the terms on which VCM projects are seen as attractive and the geopolitical climate will exert an influence given the location of the reserves of many important commodities and the industrial capacity to process them.

Exploring the impacts of all the variables noted above is beyond the scope of this introductory paper. However, we have included below two estimates of the future scale of VCMs. They illustrate the wide variation in potential outcomes. The Taskforce on Scaling Voluntary Carbon Markets (TSVCM)²³ highlights the significant mobilisation efforts required to leverage nature-based solutions and direct air capture with carbon storage and draw attention to VCMs as alternative means to emissions sequestration. In light of this, they estimate that in order to support the level of investment required to remain within the 1.5-degree Celsius pathway, VCMs would need to scale by a factor of 15 by 2030.

Alternatively, during the 2023 Annual General Meeting of the International Swaps and Derivatives Association (ISDA),²⁴ the ISDA CEO emphasised the pragmatic role that carbon credits play in supporting institutions that cannot entirely eliminate the use of fossil fuels while boosting investments in a greener economy. Contrasting estimates of the potential future scale of VCMs can be seen in Figure 12, which summarises TVSM's and ISDA's estimated VCM sizes.

FIGURE 12: ESTIMATES OF THE FUTURE SIZE OF VCMs

ORGANISATION	ESTIMATED MARKET SIZE	TIMEFRAME
Taskforce on Scaling Voluntary Carbon Markets.	\$5 billion to \$30 billion on the lower bound and up to \$50 billion on the upper bound (Taskforce on Scaling Voluntary Carbon Markets, 2021).	2030
International Swaps and Derivatives Association.	\$1 trillion ²⁵	Within 15 years

4.2 KEY CHALLENGES

Several challenges for the VCMs have been highlighted already. Here we go into those challenges in more detail. While the VCMs could play a significant role in global efforts to combat climate change, a number of hurdles require careful consideration for insurers to take on a bigger role in the markets.

Verification

The integrity and credibility of VCM projects and carbon credits rely on the robustness and transparency of the verification process. Verification checks are a critical step for investors as they help to ensure that the carbon credits they acquire are genuine emission reductions and that the VCM project meets rigorous standards, including the avoidance of exploitation of local communities. However, the process of verification faces many challenges such as the lack of regulation in this area, project quality and reliance on information from third-party agencies to perform verifications.

Currently there is a lack of transparency on climate impacts and global standards for the VCMs. Besides the challenges with verification of projects themselves, there is also evidence emerging of the limited climate impact some projects are delivering and that significant shares of end-user costs are not reaching the projects and communities that actually require the financial support. A 2022 Bloomberg article covers a reforestation project in Mexico which was found to deliver only about a weeks' worth of wages to the community for the project after more than two years' worth of work.²⁶

23 Taskforce on Scaling Voluntary Carbon Markets, About Us, op cit.

24 ISDA. About ISDA. Retrieved 20 November 2023 from <https://www.isda.org/about-isda/>. ISDA has over 1,000 member institutions from 79 countries. These members comprise a broad range of derivatives market participants, including corporations, investment managers, government and supranational entities, insurance companies, energy and commodities firms and international and regional banks.

25 ISDA (10 May 2023). ISDA Annual General Meeting (AGM) 2023: Day 1 Scott O'Malia Opening Remarks. Retrieved 20 November 2023 from <https://www.isda.org/2023/05/10/isda-agm-2023-day-1-scott-omalina-opening-remarks/>. During these opening remarks, CEO O'Malia stated that efforts to scale this market have been underway for several years, and it's estimated that it could reach \$1 trillion within 15 years.

26 Bloomberg.com. (27 June 2022). BP Paid Rural Mexicans a "Pittance" for Wall Street's Top Climate Solution. Retrieved 20 November 2023 from <https://www.bloomberg.com/features/2022-carbon-offset-credits-mexico-forest-bp/?leadSource=uverify%20wall#xj4y7vzkg> (subscription required).

The World Economic Forum in its 2023 report "The Voluntary Carbon Market: Climate Finance at an Inflection Point"²⁷ states that the carbon market supply side needs reforms to ensure that carbon credits are a trustworthy representation of real mitigating action. The report also points out that leading companies are investing a lot of their time and effort into assessing the quality and integrity of their carbon investments, but a lack of market standards and guidelines makes it difficult for them to distinguish the quality of projects.

Therefore, it is necessary for companies purchasing carbon credits to conduct their own verifications and take the time to perform due diligence on developers, intermediaries and the quality of projects and credits created. However, verification is a highly specialised process which can be a heavy burden for companies starting out on their VCM journeys and a significant barrier to entry for smaller organisations without the resources available.

The challenges around verification also have potential reputational impact for companies. The World Economic Forum points out the scope for additional scrutiny from the public eye as well as legal action if VCM projects are not as they are advertised.²⁸ This reputational risk may not arise from the VCM project itself, but could result, for example, from human rights issues created as offshoots from VCM projects.²⁹

Tackling verification

Confidence in the quality, transparency, emission reduction and community benefits of VCM projects is crucial for the future scale and liquidity of trading in credits and thus regulation and the evolution of global standards around verification are expected to be key enablers. According to the Berkeley Carbon Trading Project, there is also a specific need for setting out industry guidelines for reporting on projects by brokers and companies, including public disclosures of assumptions and calculations.³⁰

These regulations and public disclosures should help improve the transparency of VCM projects and combat project quality challenges. Additionally, there are suggestions that a minimum pricing floor could help to cut out low-quality projects from the markets while promoting higher-quality projects and their brokers.³¹

Several companies, for example Slyvera³² and BeZero,³³ now provide ratings for carbon projects which are similar in concept to credit ratings provided for traditional debt instruments by agencies such as Standard & Poors or Fitch. For example, the rating scale adopted by BeZero provides a view on the likelihood that a given credit achieves a tonne of CO₂e avoided or removed with a rating range running from "AAA" for the highest likelihood to "D" for the lowest.

Providers aim to aggregate information relating to a VCM project to determine an overall risk rating for that project based on the likelihood of the quoted amount of carbon removal or reduction being achieved. This provides buyers with additional information, in summarised and easy-to-understand form, that can help them build a picture of the credibility of carbon credit delivery from projects they may be interested in.

27 World Economic Forum (17 January 2023). The Voluntary Carbon Market: Climate Finance at an Inflection Point.

Retrieved 20 November 2023 from <https://www.weforum.org/publications/the-voluntary-carbon-market-climate-finance-at-an-inflection-point/>.

28 Dvorak, P. (30 October 2023), He Pioneered Carbon Offsets, op cit.

29 United Nations Development Programme (18 May 2022). What are carbon markets and why are they important? Retrieved 20 November 2022 from <https://climatepromise.undp.org/news-and-stories/what-are-carbon-markets-and-why-are-they-important>.

30 Berkeley Carbon Trading Project (5 January 2021). Comments on the Initial Recommendations of the Taskforce on Scaling Voluntary Carbon Markets (TSVCM). Retrieved 20 November 2023 from <https://carbonplan-assets.s3.amazonaws.com/docs/Offset-Task-Force-Comment-Letter-01-05-2021.pdf>. To support public confidence in offset credit markets, the Berkeley Carbon Trading Project strongly recommends requiring the public release of project information needed to understand the project and reproduce the credit calculations, including project design documents, monitoring reports, verification reports and calculations of baselines and emissions reductions.

31 L., J. (2 March 2023). Inside Carbon Markets: Problems, Causes, and Potential Solutions. Carbon Credits. Retrieved 20 November 2023 from <https://carboncredits.com/inside-carbon-markets-problems-causes-and-potential-solutions/>. Setting carbon price floors is relevant to rule out questionable offset credits and dealers. Plus it will promote the desirability of high-quality credits that result in more equitable outcomes. This is particularly applicable to local communities, Indigenous Peoples, and the Global South.

32 Slyvera. Carbon credits are the "net" in net zero. Retrieved 20 November 2023 from <https://www.sylvera.com/ratings>.

33 BeZero. Global Carbon Ratings. Retrieved 20 November 2023 from <https://bezerocarbon.com/ratings/>.

Permanence

An important feature of a VCM project is the permanence of the underlying mitigation effect, that is, how long the carbon removed or avoided will be kept from the atmosphere. One hundred years is a common benchmark for a VCM project to be considered "permanent," which is a more practical time horizon than requiring perpetual removal or avoidance.³⁴ Regardless of the amount of time for which a VCM project is expected to remove or avoid carbon, there is a risk of reversal if physical disruption to the project results in sequestered carbon being released back into the atmosphere. Such reversal events may occur intentionally (e.g., due to a subsequent change in land usage), may be beyond the project developer's control or may result from poor project implementation and/or ongoing management. For example, the risk of wildfires resulting in the destruction of a reforestation project may change due to climatic effects of temperature and rainfall but are also linked to the planting and management of the woodland created. Ultimately, of course, trees die and decay releasing carbon back into the atmosphere unless further action is taken, e.g., ensuring the wood is used, say for construction. Thus, the permanence of many VCM project impacts is subject to a number of future uncertainties as well as potential changes in the accepted definition.

Tackling permanence

Risk-buffering mechanisms are often used to address concerns around permanence, whereby some of the offset credits arising from a VCM project are allocated to a buffer reserve, which pools credits from several different VCM projects. This reserve is then used to compensate for any carbon loss by retiring a number of credits equivalent to the carbon reversal that occurs from any VCM project within the pool. Establishing a suitable size for the buffer pool is key, because full depletion of the buffer pool would mean that participating projects are no longer protected against reversal risk and can no longer claim permanence. Therefore, the number of credits each VCM project is required to contribute to the buffer pool should be based on an assessment of each project's level of reversal risk using a consistent risk-assessment framework, akin to setting capital requirements for insurers. The California forest offset protocol is an example of a programme of VCM projects which utilises a buffer pool mechanism. Studies indicate that the buffer pool used by the California forest offset protocol is severely undercapitalised, in particular in relation to risks from wildfires and disease and is therefore unable to ensure that contributing projects will keep credited carbon out of the atmosphere for at least 100 years.³⁵ This illustrates the obvious challenges in assessing reversal risks over very long time horizons and indicates that the methodology used to determine the appropriate size of a buffer pool is an area requiring further development.

Whether acting as a project investor or a buyer in the voluntary carbon market, a VCM project which contributes to a risk-buffering mechanism is likely to be more attractive to an insurer. However, from a project developer perspective, contributing to a buffer pool means that a greater number of carbon credits need to be created than can be sold (for example, if the buffer pool contribution is 20%, then 1.25 credits need to be created for every credit sold). Some compensation for this may arise if a higher price can be achieved due to the use of a buffer pool, i.e., due to improved certainty around permanence.

Insurers may have a role in utilising their capital assessment and management expertise to contribute to the challenge around determining the appropriate size of buffer pools.

34 Sylvera (16 December 2022). Permanence in carbon credits: Why it matters, and how to evaluate it. Retrieved 20 November 2023 from <https://www.sylvera.com/blog/permanence-carbon-credits#:~:text=So%20when%20we%20talk%20about,brand%20itself%20as%20'permanent'>.

35 Badgley, G. et al. (5 August 2022). California's forest carbon offsets buffer pool is severely undercapitalised. *Frontiers*. Retrieved 20 November 2023 from <https://www.frontiersin.org/articles/10.3389/ffgc.2022.930426/full>.

Additionality

Another key concept for VCMs is "additionality," which can be considered in the context of the VCM project itself and in the context of carbon credits generated by the project. A VCM project is considered additional if it results in carbon reduction or removal *in addition to* the amount that would have occurred in the absence of the project or as mandated by regulation or policy. This is usually part of the project validation stage to ensure the additional benefits will be achieved. Likewise, a carbon credit is considered additional if the associated VCM project results in emissions reductions *in addition to* the amount that would have occurred without the financial incentive provided by the VCM.

To determine the additionality of VCM projects, establishing the baseline for the VCM project is crucial. This assessment can be complex and requires consideration of a range of factors, including the project's regulatory, market and technological context. It requires the determination of a credible counterfactual to assess what would have happened in the absence of the project. Furthermore, it involves continuous evaluation to ensure the project remains additional throughout its life cycle.

Establishing the baseline for a carbon credit has further complexities, as this also requires obtaining accurate emissions data or carbon content, e.g., for soil for the baseline scenario and projecting this forward over the period required to demonstrate permanence.

A key part of the challenge here is that there are not yet common standards or regulations by which additionality, baselines and counterfactual scenarios are assessed. In theory, a credit should not be created without verification of additionality. However, it is conceivable that regulations are introduced in future with regard to additionality which could render past credits unviable. It could even be that standards diverge across regions meaning some credits are accepted in some regions but not others. There does not need to be any malintent for this to happen. It could emerge purely as a function of the early stage of VCMs and their associated projects.

Tackling additionality

The use of a common assessment framework would help address some of the challenges around additionality, as this would aid the establishment of credible baselines which could be used and tailored as appropriate across project types and would reduce the level of judgement and subjectivity involved. An example of such an initiative is the [College of Agriculture, Food & Rural Enterprise \(CAFRE\) Soil Carbon Project](#) in Northern Ireland. This VCM project is aiming to quantify soil carbon levels in farmland across Northern Ireland, thus establishing a common baseline to help determine the additionality of agriculture-related VCM projects in future. The CAFRE Soil Carbon Project will also provide an understanding of how soil carbon levels change under different land management practices, aiding the planning and management of future carbon storage methods.

Summary

Continuing efforts to reduce global GHG emissions and a growing appreciation of threats to critical areas such as soil health, water quality and biodiversity provide a very positive underpinning for the future development and growth of VCM projects.

Nevertheless, if the potential of these markets is to be realised multiple challenges will need to be addressed around their operation and in particular to improve investor confidence in the outcomes. Initiatives to tackle these are well underway and the development and implementation of common standards alongside more robust regulation should help. However, it will be important that this is done in a proportionate way that avoids driving up costs and stifling innovation.

Regarding the role of insurers, our conversations indicate that there is enthusiasm for the types of projects that VCMs facilitate but also a strong element of caution pending material progress in addressing the risks and challenges.



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- Allied Offsets. (July 2022). Supply and Demand in the UK Voluntary Carbon Market. Retrieved 20 November 2023 from <https://www.theccc.org.uk/wp-content/uploads/2022/10/Supply-and-Demand-in-the-UK-Voluntary-Carbon-Market-Allied-Offsets.pdf>.
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