

# Fungibility Challenges in the Carbon Markets

Can carbon credits be ‘like-for-like’?

# The Fungibility Challenge

## Key Points

### Carbon insurance provides protection against under-performance.

Tailored insurance protection for carbon credit purchases and investments mitigates risks such as natural catastrophes, fraud and negligence, insolvency and abandonment, carbon standard and methodology change, and political or regulatory risks that can cause a carbon project to underperform. By reducing risk, insurance provides a stamp of confidence on carbon investments and a safeguard against unexpected events, thus enabling greater flows of finance towards the carbon projects that are making a positive difference.

### Carbon insurance can pay insurance claims in cash or carbon.

Insurance provides protection against pre-defined loss. This “loss” doesn’t need to be defined on purely financial terms. For example, a phone insurance policy might pay an insurance claim with a replacement phone of equivalent value to the phone lost. In the carbon markets, a loss can be ‘cash’ – such as the amount invested into a project or the financial value of the carbon credits, or it can be ‘carbon’ – such as the carbon credits the carbon project was expected to deliver.

### Paying claims in carbon – a 'like-for-like' replacement.

Carbon projects are assessed on agreed categories throughout the market – such as additionality, leakage, permanence, co-benefits – but the variety of carbon projects and range of prioritisation between buyers/investors across these categories means that while a tonne of carbon dioxide is a tonne of carbon dioxide, carbon credits are assessed and valued according to differing criteria, making provision of replacement carbon credits challenging. For end users such as corporates with net zero strategies, this can translate into reputational risk if replacement carbon credits are not deemed “similar enough” to the original carbon credits. For investors, intermediaries, liquidity providers and standards bodies in the market, this discussion often centres on “fungibility”.

### Fungibility in carbon markets is a challenge.

Fungibility is defined as “(of a product or commodity) replaceable by another identical item; mutually interchangeable.” The lack of fungibility between carbon credits reduces liquidity in the market and creates challenging levels of due diligence, thereby increasing transaction costs. In this paper we examine different aspects of this fungibility challenge and provide our own perspectives as a carbon insurance specialist providing ‘like-for-like’ carbon credit replacements in the instance of insured losses.

1. Introduction p.04
2. The fungibility challenge – why does this challenge exist in the carbon markets? p.07
3. Fungibility – key considerations p.11
4. Claims in carbon – paying insurance claims in replacement carbon credits p.16
5. Conclusion p.20

# Introduction

## Why Insurance?

Insurance is a risk management mechanism common across standardised markets, including markets analogous to the carbon markets such as commodities and bonds. Insurance works by transferring risk to a specialised third party (an insurance company) which distributes the risk amongst a larger pool. This enables parties to mitigate risks which are otherwise challenging or not cost-effective to manage via their own balance sheet. Therefore, insurance can help to reduce barriers to entry and enable financing.

The insurance industry has started to focus on the carbon markets, with innovative insurance companies starting to release novel carbon insurance products.



Kita's flagship product, Carbon Purchase Protection Cover, protects buyers of/investors in forward purchased carbon credits against the risk that the expected number of carbon credits are not delivered – whether that be due to unavoidable losses (such as natural catastrophe); counterparty risk (such as fraud and negligence, abandonment and insolvency); or carbon risks (such as change in carbon methodology).

This provides buyers and investors with the confidence to proactively engage in the carbon markets with improved risk management, thereby unlocking capital to scale high-quality carbon projects.

This is one example of how insurance can influence and strengthen risk management within the carbon markets, helping create standardised frameworks for assessing and managing evolving risks.

Another example is fungibility.

Companies proactively engaging in the carbon markets often do so to generate return on investment, manage carbon market price exposure, and – importantly – secure supply of high-quality carbon credits to safeguard high-integrity net zero strategies. Often a key concern for end users of carbon credits is reputational damage associated with low quality credits.

Therefore, in the instance of a loss that results in an insurance claim, replacement carbon credits that are high-quality and compliant with relevant standards can be the ideal insurance claim compensation.

This leads directly into fungibility considerations – which replacement credits are suitable to cover the loss?

At Kita, in considering how to best enable insurance claims paid in replacement carbon credits, we have spoken to individuals and companies across the market. Three points are clear:

1. Current lack of carbon credit fungibility, or ‘mutual interchangeability’, is a challenge across the market.
2. A Best Match Method, or means of determining suitable replacement credits, is essential for an insurance company, or any liquidity provider, seeking to provide suitable replacement credits in the instance of a loss\*.
3. Like many aspects of the carbon markets, ‘fungibility’ will rapidly evolve with best market practice. However, a quest for perfection does not mean we can’t act today to start developing frameworks and guidance that can help move the market towards more widely accepted fungibility criteria in the future.

\* If you are interested in understanding how insurance can interlink with buffers of carbon standards, please see Kita’s earlier report here: [Buffers and Insurance in the Voluntary Carbon Market: A Comprehensive Overview – Kita](#)

# Introduction

## Fungibility

In this paper we examine this fungibility challenge.

We intend this paper to serve as (1) an educational primer for those new to the concept of fungibility; and (2) an invitation to further discussion with experts in the market who wish to dive deeper.

This paper is not intended to outline ‘how fungibility should be done’, but instead to highlight key considerations and a nuanced perspective from a carbon insurance specialist providing ‘like-for-like’ carbon credit replacements in the instance of insured losses.

We see this as an evolving topic and look forward to further collaboration with the market.

If you would like to join the conversation, please don't hesitate to get in touch.



[Natalia Dorfman](#)

Chief Executive Officer



[Paul Young](#)

Chief Technology Officer



[Racheal Notto](#)

Director of Carbon Markets  
Engagement



# The Fungibility Challenge

## Why does the fungibility challenge exist in the carbon markets?

Fungibility is defined as “(of a product or commodity) replaceable by another identical item; mutually interchangeable.”

---

### Fungible

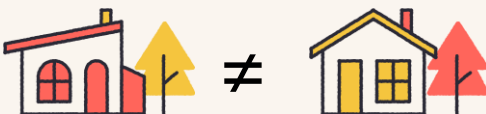
Mutually interchangeable; if you lost one, you would happily accept its replacement




---

### Non-Fungible

Non interchangeable; if you lost one, you would be specific about a suitable replacement



Within the carbon markets, fungibility (or lack thereof) is often used in comparison to commodities markets. For commodities markets to function, there must be confidence that all producers are working to the same standard such that the market values different instances of the commodity as equivalent, regardless of who produced it. There must also be enough of the commodity to enable market liquidity.

The basis of a carbon credit is that each credit represents one metric tonne of carbon dioxide or carbon dioxide equivalent (tCO<sub>2</sub>e) that is either avoided, reduced or removed from the atmosphere. Technically this should mean that “a tonne is a tonne”, regardless of the type and location of carbon project where the tonne in question originated. Thus, carbon credits are frequently discussed as a commodity.

However, there are key differentiators between the commodities markets and the carbon markets:

	Commodities Markets	Carbon Markets
<b>Standards</b>	Commodities follow strict and defined rules on standards and regulations that must be adhered to.	The carbon markets have evolving standards, that strive for regular strengthening and reassessment.
<b>Nuance</b>	There is nuance within commodities markets, from different types – e.g. oil vs sugar, to within type – e.g. Brent crude trades at a different price to WTI crude, based on factors such as sulphur content and sourced location.	Carbon credits are assessed on similar criteria – e.g. additionality, permanence, co-benefits – but individual buyer preference across these criteria impacts perceived quality and price.
<b>Liquidity</b>	While changes in supply will influence market price, broadly speaking there is enough supply of the commodity to enable market liquidity.	Can have significant supply constraints, particularly for specific types of carbon credits, such as removals. Liquidity is a challenge.
<b>Tangibility</b>	A commodity is a raw material that can be used to produce other finished goods. The commodity itself is also a physical good that can be seen and tested. Thus, the confidence in fungibility is based in part on standards and in part on the fact that quality can be directly assessed.	Rather than being a physical good, carbon credits are an intangible good linked to a physical asset (e.g. purchasing carbon credits that are tied to standing trees). The intangibility of carbon credits is what makes the importance of standards so essential.

## Tangibility is key

The intangible nature of carbon credits, the inability to touch/taste/feel the actual carbon stemming from the physical asset, creates an inherent level of uncertainty surrounding carbon credit quality and performance.

This leads to a debate as to whether carbon credits should be treated more like bonds, where market underpinnings such as standards, audits, ratings and insurance help drive risk-driven pricing and ‘risk scoring’ that enables direct quality comparisons\*.

\* For more, please see Kita’s report with BeZero: [The three pillars of integrity in the carbon removal market](#).



Regardless of type of market – commodity or bond or something altogether new – a key challenge is lack of trust in quality and the associated reputational risk buyers and investors face when proactively engaging in carbon credit purchasing and investments. This is driving buyers and investors to, for example:

1. Do extensive amounts of due diligence prior to finalising carbon credit transactions.
2. Align due diligence requirements and buying preferences to wider messaging on net zero strategies; for example linking carbon credit purchases to issues close to their company (such as region) or wider initiatives (such as sustainable development goals).
3. Increasingly differentiate between “reduction”, “avoidance” and “removal” carbon credits.

## The result?

There is much room for nuance and individual buyer preferences across (i) how these factors are weighted, (ii) how the additional range of co-benefits are considered; and (iii) how further preferences and risk appetite across aspects such as country risk and carbon type influence decision making.

These factors mean that buyers of, and investors in, carbon projects engage with these projects in very specific ways; looking for the criteria that matter most to them. The price of carbon credits therefore varies widely on ‘desirability’ considerations that aren’t necessarily directly related to the project’s ability to avoid, reduce or remove one metric tonne of carbon dioxide from the atmosphere.

↑ This means a tonne is most certainly not a tonne, causing significant constraints on fungibility.

## Key areas of buyer and investor preference that impact upon fungibility:

<p>Type</p>	<p>With projects ranging across cookstoves, renewables, afforestation, biochar, peatland, direct air capture, and many more, there are multiple types and vintage of carbon credits one can choose from, with corresponding positives and negatives.</p>
<p>Location</p>	<p>The location of a carbon project is key for many reasons: High-level country risk factors such as political and regulatory risks; local community engagement, benefit-sharing and relevance to the buyer's operations; specific factors such as exposure to natural catastrophe risks, which varies widely from country to country.</p>
<p>Co-benefits</p>	<p>A key consideration that interlinks with wider climate strategies of carbon buyers and investors, including relevance to Sustainable Development Goals which different buyers will prioritise in different ways.</p>
<p>Permanence</p>	<p>Carbon projects focused on durability of carbon storage that are able to demonstrate the permanence of their solutions can command a higher price.</p>
<p>Reduction/ Avoidance/ Removal</p>	<p>Buyers may have personal preferences for reduction, avoidance or removal projects, however there are core considerations to these projects that can influence fungibility:</p> <ol style="list-style-type: none"> <li>1) Price: removal projects, particularly those that incorporate high durability, are significantly more expensive than other project types.</li> <li>2) Time: removal projects tend to be more capex intensive to get off the ground, which means many carbon removal credits are still “ex ante” or forecasted to be delivered in the future. Given the length of time in carbon removal processes, time (and thus scale) can be a limiting factor for fungibility.</li> <li>3) Availability: there are significantly more reduction/avoidance credits available on the market today, meaning there are more seemingly ‘equivalent’ credits compared to the wider scarcity of removal credits.</li> <li>4) Readiness: carbon removal techniques are at varying levels of technological readiness and require associated market improvements to scale – from methodologies to monitoring, reporting and verification to ratings to insurance. Fungibility criteria will need to stay aligned as improvements are made.</li> <li>5) Investment: significant investment is required to bring new technologies and methods to readiness levels, which links heavily to the four factors above.</li> </ol>

How do we overcome the fungibility challenge in the carbon markets?

Let's consider this in three parts.

1.



Underpinnings to enable fungibility

2.



Tactical considerations to move towards fungibility

3.



Wider market perspectives on fungibility

## 1. Underpinnings

To overcome the inherent ‘intangibility’ challenge referenced previously and provide the underpinnings upon which to build fungibility frameworks, we must look to:

- (i) generate confidence and transparency in carbon forecasts, audits and risk analysis tools;
- (ii) access transferable skills from other industries that specialise in liquidity management; and
- (iii) ensure safeguards are in place to protect investments when outcomes are not as expected.

Kita's focus is the role insurance plays across these categories, supplemented by working with other market players.

- i. **Risk assessment:** Insurance providers build risk models to price risk per type of carbon project (e.g. biochar) and/or type of risk (e.g. political risk). Risk models focused on core considerations of carbon credit fungibility – for example delivery and reversal risk – will play directly into wider frameworks on fungibility by creating risk comparison metrics and models. Insurers are not the only ones who focus on this space; for example, ratings agencies play a key role in bringing independent opinions that are central to this debate.
- ii. **Liquidity management:** Insurance – alongside other carbon market participants in the liquidity/brokerage/risk management space – can influence fungibility via liquidity management. A key role of insurance is to pay insurance claims. Portfolio management and ongoing liquidity assessment is key to this function, as it would be for any other portfolio management provider. Thus, an underpinning of fungibility can be liquidity management skill sets, which inherently factor in replaceability and price assessments around different carbon credits. This is core to the ability to pay insurance claims in replacement carbon credits, which is the perspective via which Kita is viewing the fungibility challenge.
- iii. **Safeguards:** Insurance is an inherent part of most investments in the traditional commodities space; for example to protect against non-payment or political risk. Insurance is also standard in the bond markets; for example to underwrite the risk that a bond will not return its payment on time. Similarly, insurance will play a key role in the carbon markets; protecting carbon credit investments and providing resilience by paying claims when things go wrong. This in turn builds trust and scales financing across the sector.

# Key Considerations

## 2. Tactical considerations

To move towards a place where fungibility is possible for, and beneficial to, carbon markets, there are many variables to consider. Just like buyer and investor preferences for carbon credits vary widely, so too will the opinions of each market player on each variable needed to define fungibility.

We believe two key things are true:

1. We must start with a “naive model”, with tactical steps and structured outcome assessments such that we can work towards accuracy, but not let perfection be the enemy of good (and a deterrent to near-term action).
2. A framework for fungibility is the goal, not a concrete definition. We must build a framework that enables new entrants, such that innovative carbon techniques being developed today can enter fungibility discussions even when direct ‘like-for-like’ does not yet exist at scale.

We do not purport to have all the answers to fungibility, but we do believe in proactivity and collaboration. Thus, questions on our mind that we believe merit wider discussion include:

At what level is fungibility possible?

How and by whom are fungibility frameworks defined?

Could homogenisation of credits reduce levels of investment to high durability solutions?

Will the introduction of fungibility lead to more market fragmentation?

What level of market agreement is required to manage this risk?

# Key Considerations

## 2. Tactical considerations

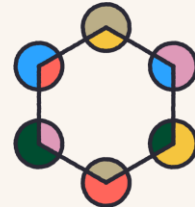
With these points in mind, tactical considerations to move towards fungibility could include:

---

*Industry forums to coalesce market opinions* – Disagreement is inevitable but this does not prevent forward movement with framework assessments that can change as markets coalesce.



*The need to define variables to build frameworks* – Starting definitions of “required attributes” and “comparison attributes” within fungibility frameworks, with ongoing assessment.



*Managing risk to investment levels in new and emerging carbon solutions/solutions with high price points by separating the issue of fungibility from financing* – Investment needed to develop a carbon project, price of a carbon credit, and value of a carbon project are three related but separate components.

---





# Key Considerations

## 3. Market perspectives

A community is building around fungibility to debate ongoing questions and move forward tactical considerations. We value the perspectives from leading experts in the space, such as the thought leadership below covering key areas of importance:

### Permanence:

A leading variable as it ties directly to the discussion of effectiveness of temporary storage of carbon versus permanent storage. Groom and Venmans's paper ['Social Value of Offsets'](#) (2023) centres its discussion on permanence and additionality, with assessment of the value of temporary storage measured in terms of economic damages avoided, as a well-defined fraction of the social cost of carbon, reflecting duration and risks of non-additionality and failure. Their estimation yields a "rule of thumb: one carbon credit sequestering one tonne of CO<sub>2</sub>e for 50 years is equivalent to between 0.33 and 0.5 tons permanently locked away." A differing perspective comes from Nori's ['Carbon Removal Blended Tonne Whitepaper'](#). While the paper focuses on carbon removals, the outcome illustrates how carbon credits with varying degrees of permanence can be stacked to provide immediate and lasting impact by balancing carbon technology options available today with expected future growth from others.

### Comparisons across type:

Following a slightly different narrative, Matthews' et al. (2023) paper ['Accounting for climate benefit of temporary carbon storage'](#) notes how comparison of avoidance, reduction, and removal credits on a single metric is not entirely beneficial because all provide their own unique value. This paper uses tonne-year accounting as a mechanism to favour carbon storage (even when temporary) as it still provides a benefit by delaying impacts of said carbon being released and contributing to a lower peak global temperature.

### Credit ratings:

BeZero's ['Making Credible Claims: a risk-adjusted approach to using carbon credits'](#) provides useful insight on how project level credit ratings can be used to discount credits. BeZero's writing is helpful as it gives specific rates for discounting at each possible carbon credit score with a clear rationale.

### Climate science:

Like all things carbon credit related, a discussion of this magnitude cannot purely rely on market dynamics. It must infuse climate science. The Carbon Market Watch report ['A framework for assessing the climate value of temporary carbon storage'](#) does a good job explaining three climate science concepts that must be considered: (i) the atmospheric lifetime of CO<sub>2</sub> emissions; (ii) temperature impacts depend on cumulative CO<sub>2</sub> emissions; and (iii) temperature stabilisation scenarios. This report discusses equivalence ratios based on two distinct approaches, permanence (physical) and near-term benefits of deferring emissions (economic). Carbon Plan also wrote a useful report, ['Comparing carbon removal approaches that act over different timescales'](#), which is beneficial when attempting to compare carbon removals as it outlines how delays to carbon removal and carbon cycle feedbacks both impact how carbon removal interventions influence atmospheric CO<sub>2</sub> over time.

# Claims in Carbon

## Paying insurance claims in replacement carbon credits



Kita provides tailored insurance protection for carbon credit transactions, providing a stamp of confidence and protecting against the risk of under-performance. We recognise buyers and investors proactively engaging in the carbon market are doing so to secure supply of high-quality carbon credits. Therefore, in the instance of a loss that results in an insurance claim, replacement carbon credits can be the ideal insurance claim compensation.

However, as noted above, fungibility is a key challenge\* and one that insurance companies will not be able to avoid. Thus, how can insurance companies – or other liquidity providers in the market – take proactive steps in an imperfect space?

Kita's approach to enabling insurance claims to be paid in replacement carbon credits is our Best Match Method, outlined on the following pages.

This is our first iteration of the Best Match Method. We will continue working with advisors and market experts to ensure we align to best market practice and that our clients benefit from ongoing improvement.

\*Liquidity is another challenge, albeit one we aren't focusing on in this report.

# Claims in Carbon Summary



Kita's clients have the option to be compensated for insured losses in replacement carbon credits instead of cash payment. Whether they want replacement credits and what counts as a viable replacement is decided by a client at the time of binding their insurance policy. The replacement credits are intended to provide a 'like-for-like' replacement of the undelivered carbon credits. Cash payments remain an option for clients if they prefer.

We believe that the option to receive eligible claims in replacement carbon credits gives carbon insurance buyers greater flexibility in risk management options, more confidence in meeting high-integrity net zero targets and clearer frameworks for managing reputational risk, in the event that carbon investments underperform.

## Policy Set-up



- ✓ Optional add-on
- ✓ Client picks claims paid in carbon credits
- ✓ Client agrees to Best Match Method

## Active Policy



- ✓ Regular review
- ✓ Kita reports on "carbon risk management"
- ✓ Kita obtains quotes for at-risk accounts
- ✓ Kita actively secures liquidity

## Claim Made



- ✓ Loss assessment of insurance claim agreed
- ✓ Kita performs Best Match Method
- ✓ Replacement credits provided

# Claims in Carbon

## Best Match Method Summary



Kita's approach for enabling insurance claims to be paid in replacement carbon credits is our Best Match Method.

This approach is intended to:

- i. enable carbon insurance buyers to benefit in the near-term from greater flexibility in risk management options, confidence in meeting their high-integrity net zero targets and clear frameworks for managing reputational risk when carbon investments underperform;
- ii. provide a framework via which we can act today, while enabling structures to incorporate ongoing feedback of advisors and market experts and maintain pace with wider evolving best practices, science and standards; and
- iii. do this in a transparent, repeatable way to maintain integrity and outline decision-making processes with predictable outcomes.

The Best Match Method is based on four key aspects:

**Required Attributes:** attributes of Replacement Credits that must match exactly those of the undelivered carbon credits. Determined alongside Kita's client and advisors.

**Comparison Attributes:** attributes used to measure the similarity between carbon credits but that do not need to exactly match the undelivered carbon credits. Assessment includes ordinal metrics, categorical properties, continuous metrics, and Boolean (true/false) values.

**Selection of Replacement Credits:** attributes are compared for similarity and credits are selected such that the average values are as close as possible to the undelivered carbon credits.

**Carbon Supplier Pool:** carbon credit suppliers selected by Kita to provide a sufficiently liquid and diverse source of Replacement Credits. Multiple suppliers are used to provide independent estimates of the price, availability and attributes for matching credits and reduce conflicts of interest.

1. **Continuous Review**  
The set of required and comparison attributes is regularly reviewed to evolve with market best practice, and the Carbon Supplier Pool and Advisory Board will likewise be subject to regular review.

# Claims in Carbon

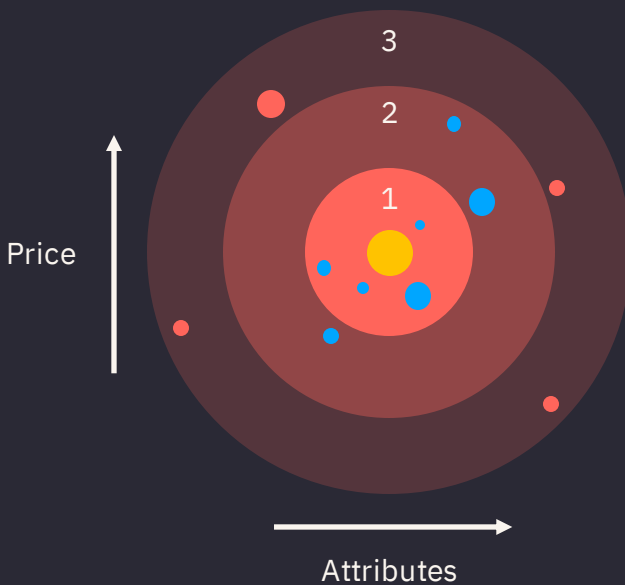
## Best Match Method Summary

The Best Match Method aims to provide the best available match to both type and value of the unrealised carbon credits.

Should it occur that 'like-for-like' is not possible, an insurance claim in cash is always a fallback option.

Illustration of the best match process:

- The central yellow circle represents the credits lost by the insured, and the size of the circle represents the claim amount.
- Kita searches for the best matching credits in terms of both price and attributes available in the market.
- The search widens until the cumulative total value of matched credits equals the claim amount and the average price and attributes are the closest match to the credits lost.



- Lost credits
- Best match
- Additional credits

Fungibility in the carbon markets requires a delicate balance between advancing growth of high integrity carbon markets and accounting for the multifaceted variables that influence fungibility assessments.

The pursuit of immediate perfection runs the risk of creating fungibility metrics that are too static and not suited to responding to an evolving market – from both a commercial and scientific perspective.

In the future, the market has the collaborative potential to develop more concrete definitions for fungibility.

Today however, a desirable outcome is a ‘good enough’ and implementable process that can reasonably be agreed as ‘like-for-like’ and is repeatable and transparent.

Integrity of the process is pressing, and greater precision can follow as science and evidence mature to provide appropriate levels of support.

⇒ Fungibility in the carbon markets is challenging, but not impossible to navigate. Please reach out to the Kita team if you would like to discuss fungibility or learn more about our Best Match Method for insurance claims in carbon credits.




## Kita – We Insure Carbon.

As the carbon insurance specialist, Kita develops bespoke carbon insurance products that safeguard the quality and performance of carbon transactions. By reducing risk, carbon insurance channels investment towards high quality carbon projects, enabling them to scale at the pace needed to address the climate crisis.

Kita is a coverholder at Lloyd's of London, the world's specialist insurance and reinsurance market.

Kita's flagship product is [Carbon Purchase Protection Cover](#), protecting buyers of forward purchased carbon removal credits against under-delivery.



Coverholder at 

[www.kita.earth](http://www.kita.earth)

[www.linkedin.com/company/kitaearth](https://www.linkedin.com/company/kitaearth)

[info@kita.earth](mailto:info@kita.earth)

Kita Earth Limited (no. 981700) is an appointed representative of Gateway Platform Services Ltd for Insurance Distribution activities.

Gateway Platform Services Ltd is authorised and regulated by the Financial Conduct Authority (no.790558). You can check this by visiting the Financial Services Register at [www.fca.org.uk/register](http://www.fca.org.uk/register)

*Kita*

We Insure  
Carbon