



DLT AND THE VOLUNTARY CARBON MARKETS
CAN A BALANCE BETWEEN RISK AND OPPORTUNITY BE STRUCK?

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At a glance

In this paper, we consider some of the potential benefits and detriments associated with the use of distributed ledger technology (**DLT**) in the voluntary carbon markets. For example, do the carbon markets create problems that require DLT solutions? Is the use of DLT in the voluntary carbon markets inevitable and if so, should this be embraced rather than resisted? Should the voluntary carbon markets seek to attract some of the capital that has found its way into the crypto markets?

There is potential for a broad range of uses of DLT in the carbon markets.

For instance, the Taskforce on Scaling Voluntary Carbon Markets (**TSVCM**) has in its Phase 1 report, recommended the use of a shared digital data protocol across the voluntary carbon standards (the **Standards**) which explores the use of, amongst others, DLT to further improve speed, accuracy and data integrity. One commentator has suggested that “*DLT can help increase the integrity of carbon markets, make offset markets more efficient, facilitate increased access*

and therefore demand, unlock supply, and clarify the relationship between voluntary and compliance carbon markets.”¹ DLT is agnostic to its usage, but how it is used is key to whether that technology provides a positive or negative benefit to carbon markets. Given the greater challenges associated with the deployment of DLT in the context of carbon financial products, the article focuses on the association of DLT and carbon in that context.

A cryptoasset² has been taken to mean an asset represented digitally within a DLT.³ For the purposes of this article, we refer to a carbon token as being either (i) a carbon offset unit (**COU**) or (ii) a derivative of a COU, in each case that is represented digitally within a DLT. Further, we define a COU to be, in a broad sense, a per-tonne representation of the outcome of a carbon-related activity that has been verified to the satisfaction of the relevant Standards such as the Verified Carbon Standard (**VCS**), Gold Standard or the American Carbon Registry and thereafter, issued in a unitary form by that Standard.⁴

Given the potential real-world connection between a DLT carbon token and a COU, it is crucial that market participants understand the nature of the carbon token that is being issued, and what rights they may acquire as a token holder. In some ways, DLT-based tokens and carbon offset units each represent a complex world and the point of

intersection of the two (i.e. carbon tokens) may result in complexity-squared. These complexities can be broken down and made more understandable through disclosure and the dissemination of information to ensure that market participants are fully informed of the consequences of their choices. Transparency, disclosure and clarity are key here. The underlying issues and concerns about carbon tokens (including those discussed in this article) should be made known to investors and market participants alike.

The highly jargon-filled voluntary carbon markets being combined with the equally jargon-filled crypto and DLT markets, are a recipe for obfuscation and subterfuge in the hands of bad market actors. This therefore requires market participants to collectively enhance understanding of this still nascent space. Yet, failing to carry out proper due diligence is no excuse for naivety or ignorance on the part of the investor. However, if behaviour is allowed to go unchecked, there would be pressure to regulate. The danger for the voluntary carbon markets is that it brings regulation upon itself through its association with poorly structured and ill-considered tokenised carbon offset products. It will be important for the market to identify and distinguish carbon tokens that are carefully structured and bring utility to the market from those which have not been so well thought through, or have limited market utility.

1 Annette L. Nazareth, [The Role for Distributed Ledgers in Voluntary Carbon Markets \(12 May 2021\)](#) (last accessed 23 June 2022)

2 As identified by the UK Jurisdiction Taskforce, the principal features of a cryptoasset are its (i) intangibility, (ii) cryptographic authentication, (iii) use of a DLT, (iv) decentralisation, and (v) rule by consensus.

3 UK Jurisdiction Taskforce, [Legal Statement on Cryptoassets and Smart Contracts](#) (London: The LawTech Delivery Panel, 2019) (last accessed 15 June 2022).

4 Please note that a carbon offset unit (COU) is an issued unit and therefore, we distinguish between verified but unissued units, typically called verified emission reductions (VERs).



Introduction

It has been said that DLT can “*synthesize and support the transaction of all types of emission-related data in a shared, globally accessible environment*”.⁵

Yet, it has also been said that DLT is a solution in search of a problem.⁶

The reason for this statement is the fact that the technology has not yet successfully replaced traditional alternatives in any sphere of relevance to this article, whether that is currencies, commodities or derivatives. Yet DLT continues to be increasingly pervasive in various market arenas.

The latest arena where DLT is being deployed en masse is in the carbon markets – both the compliance and

voluntary carbon markets. The use of DLT can be applied at various different levels of these markets. For example, it is being deployed as infrastructure by the World Bank, via its ‘Climate Warehouse’, as a “*public good data layer built on blockchain technology to facilitate the transparent sharing and reporting of climate project information and their issuances*”.⁷ The intention is that, by connecting registries together through a decentralized infrastructure and making the data from that publicly available, the Climate Warehouse helps to avoid double counting risks that can damage the integrity of carbon markets. In the context of financial products, DLT technology has been applied by the decentralised autonomous organization (DAO) Klima DAO to launch its crypto-

currency, KLIMA, backed by Toucan Protocol’s Base Carbon Tonne (BCT) tokens held in its treasury which, in turn, are ultimately minted after using retired voluntary carbon offsets. Klima DAO’s stated aim is to “*become the single biggest disruptor of the carbon markets and set a precedent for a new monetary system backed by carbon.*”

We shall proceed to consider some of the benefits and detriments associated with the use of DLT in the voluntary carbon markets, and to consider the issue of whether there are aspects of the voluntary carbon markets which can be improved or resolved through DLT..

5 World Bank, [Blockchain and Emerging Digital Technologies for Enhancing Post-2020 Climate Markets \(2018\)](#) (last accessed 23 June 2022)

6 See e.g., Greta Bull, [“Blockchain: A Solution in Search of a Problem?”](#) (29 May 2018) (last accessed 15 June 2022).

7 [Climate Warehouse](#) (last accessed 15 June 2022).



Market developments that are driving the debate

We begin by considering the market developments that are driving this debate, considering other DLT initiatives, and positions adopted by industry bodies and the Standards.

DLT Initiatives in the Carbon Markets

- In October 2021, voluntary carbon offsets, mostly issued from the VCS that is managed by Verra, were retired, converted into tokens created by Toucan Protocol, and ultimately swapped by investors for the Klima DAO crypto token, the KLIMA. Although Verra had not sanctioned this product, it is understood that approximately 21.6 million voluntary carbon offsets, were retired and tokenised onto the DLT ‘on-chain’ environment. This represented a sizeable number of available

carbon offset units (**COUs**) in the market and caused a spike in the price of COUs in the latter part of 2021. However, besides the drain in liquidity and the market price impact, market participants had expressed concern that (a) the types of COUs being permitted for retirement were from projects that would not normally attract a buyer in the voluntary carbon markets (so-called ‘zombie projects’)⁸ and (b) the tokens themselves, being issued following the retirement of a COU, lacked any environmental benefit, as per the rules of the voluntary standards that created the COUs.⁹

- Toucan Protocol and Klima DAO have inspired the launch of many other DLT initiatives¹⁰ offering solutions to various perceived problems in the carbon markets or simply increased opportunities to invest (indirectly) in COUs as an asset class. Such initiatives highlight (i) the ‘crypto-backed’

capital available to be deployed in the carbon markets and (ii) the appetite for and demand of crypto-carbon products, including in the retail space.

Positions of Industry Bodies and Standards

- Industry bodies such as the International Emissions Trading Association (**IETA**) have since formed a ‘Task Group on Digital Climate Markets’ and have suggested 10 initial guiding principles for the application for digital innovation to the carbon market (the **Guiding Principles**) to ensure overall market integrity. Influenced by the experiences of the most recent crypto-carbon products, these principles include the notion that it is for the individual Standard, such as VCS, Gold Standard or the American Carbon Registry to decide whether or not to allow the tokenisation of and retirement of their COUs and

⁸ See e.g., (carbon)plan, Grayson Badgley, “Zombies on the blockchain” (7 April 2022) (last accessed 23 June 2022)

⁹ See e.g., Verra Statement on Crypto Market Activities (25 November 2021) (last accessed 15 June 2022) (“**Verra 2021 Statement**”).

¹⁰ See e.g., DeepMarkit Secures Carbon Credits for Second Stage MintCarbon.io Platform Test and NFT Market Validation, Universal Carbon, BetaCarbon CUT, Moss Earth MCO2 Token. For full disclosure, we represent Flow Carbon and do not in this article seek to advocate for one DLT product over another. Investors should fully understand a carbon token before purchasing one.

“Industry bodies such as the International Emissions Trading Association have since formed a ‘Task Group on Digital Climate Markets’ and have suggested 10 initial guiding principles for the application for digital innovation to the carbon market to ensure overall market integrity.”

that, to manage the risk of bad actors detrimentally impacting the voluntary carbon markets, token issuers should be subject to know-your-customer (**KYC**), anti-money laundering (**AML**), combating the financing of terrorism (**CFT**) and anti-bribery and corruption (**ABC**) checks by the relevant Standards.

- Gold Standard is looking to consult on the application of DLT, both in the context of (a) developing open, collaborative digital solutions for carbon market standards and monitoring, reporting, and verification (**MRV**), as well as (b) the tokenisation of the Gold Standard VER¹¹. Verra has similarly said that they will launch a consultation on crypto tokens in due course.
- Although, in the context of these initiatives there is a sense of inevitability around the application of DLT in the carbon markets, there is also a real hesitancy. For instance, the IETA Task Group has noted that digital innovations “could improve the performance of the carbon markets”. In the

context of digital climate assets, the Task Group noted that “[c]redibly digitised credits can reduce market friction, increase access for both buyers and sellers, reduce transaction fees, and scale flows of capital to the carbon market”; equally it noted that “digital climate assets raise many concerns including the seemingly speculative nature of tokenisation schemes, the loss of environmental integrity from tokenising retired carbon credits, the lack of transparency in the governance of Decentralised Autonomous Organisations (DAOs) and lastly the uncertain regulatory treatment of tokenised carbon”.

As the above suggest, there is potential for a broad range of use of DLT in the carbon markets. Further examples include the AirCarbon Exchange tokenising COUs as a means to overcome the connectivity gap between the registries operated by the various voluntary carbon standards. Carbonplace, a collaboration between a number of banks, is looking to build settlement infrastructure for marketplaces and

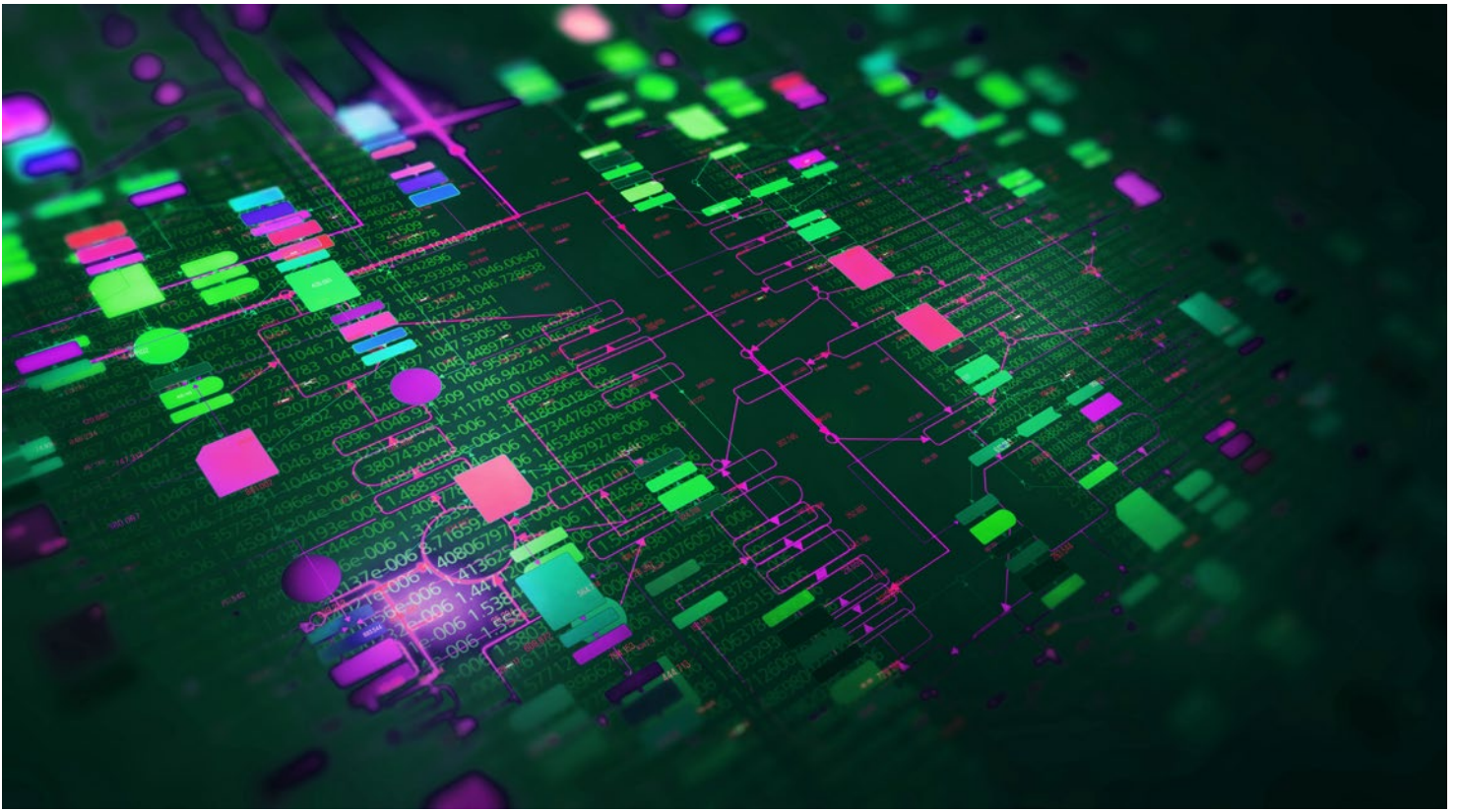
exchanges using DLT.¹² Gold Standard wishes to use DLT to improve impact data quality, reduce time and costs in the context of MRV.¹³

The aforementioned focus on DLT as a tool and not DLT as a means to create financial products. DLT is agnostic to its usage but how it is used is key to whether that technology ultimately provides a positive or negative benefit to carbon markets. Given the greater challenges associated with the deployment of DLT in the context of carbon financial products, the remainder of this article focuses on the association of DLT and carbon in that context. That is not to say there are no challenges for the use of DLT as infrastructure for carbon markets, however, that is a discussion for another paper.

¹¹ Sarah Leugers, [Blockchain for better: Untangling tokenisation and carbon markets](#) (8 March 2022) (last accessed 15 June 2022).

¹² [Carbonplace](#) (last accessed 15 June 2022).

¹³ [Gold Standard, Google.org backs Gold Standard to build digital solutions to help carbon markets work for climate justice](#) (last accessed: 15 June 2022).



Carbon financial products

In this section, we consider the regulatory and market issues arising from carbon tokens as a financial product, beginning with the possible regulatory attitude towards carbon tokens and digital identities in relation to ownership of carbon tokens.

Regulatory Oversight – Consumer Protection and Market Stability

- One of the principal challenges for central bankers and financial market regulators is to know what requires their oversight and what doesn't. The starting point is often consumer protection and market stability.
- In the context of cryptoassets, the initial position adopted by regulators was one of hesitation to intervene because they did not

want to stifle innovation. However, as various products increasingly began to impact retail customers, they have begun to regulate (and in some instances, completely ban) certain types of cryptoassets and their related activities. For instance, following the collapse of Terraform Labs' TerraUSD (UST) algorithmic stablecoin, and the associated LUNA support cryptocurrency, the G7 nation urged the Financial Stability Board (**FSB**), in close coordination with international standard setters, to advance the swift development and implementation of consistent and comprehensive regulation of crypto-asset issuers and service providers, with a view to holding crypto-assets, including stablecoins, to the same standards as the rest of the financial system. Despite being a strong supporter of the

development of DLT, Singapore has restricted the marketing, advertising and promotion of the sale and purchase of 'digital payment tokens'¹⁴ and its Deputy Prime Minister has recently stated that "[r]etail investors especially should steer clear of cryptocurrencies"¹⁵, and Japan has adopted a law to regulate stablecoins for investor protection¹⁶. However, for the most part, this has been relatively light-touch regulation.

- Crypto markets today have a total circulating value of approximately 950 billion USD.¹⁷ Volatility and unpredictability are accepted aspects of the crypto markets and excused on the basis that they are new and evolving. However, as recent events relating to stablecoins such as Terraform Labs' TerraUSD (UST) highlight, the potential for even individual cryptoassets to impact overall

14 MAS, Guidelines on Provision of Digital Payment Token Services to the Public (last accessed 15 June 2022).

15 MAS, Speech by Mr Heng Swee Keat, Deputy Prime Minister and Coordinating Minister for Economic Policies, at the Asia Tech X Singapore Summit on 31 May 2022 (last accessed 15 June 2022).

16 Natsumi Iwata and Keita Sekiguchi, Japan adopts law to regulate stablecoins for investor protection (Nikkei Asia, 3 June 2022) (last accessed: 15 June 2022).

17 Financial Times, Digital Assets Dashboard (last accessed 15 June 2022).

market stability can no longer be ignored. Therefore, regulators may start taking a more robust approach to cryptoassets. As highlighted in a recent article, “[c]entral bankers around the world are wary that the impact of a collapse of a stablecoin could spread into traditional financial markets.”¹⁸ More relevant for the voluntary carbon markets though, is the question of whether it should seek to attract some of the capital that has found its way into crypto markets?

- There are two key points that follow from this discussion on regulatory attitude in the context of the carbon markets:
 - First, voluntary carbon markets are, for the most part, unregulated. Some activities such as trading in futures contracts where the COU is an underlying asset are regulated activities. However, the day-to-day activities of most actors in the voluntary carbon markets who are purchasing and selling COUs, are mostly unregulated. It is not necessarily in the interests of voluntary markets that the actors in this sector are brought within the scope of financial regulation as a consequence of dealing in carbon tokens that become the subject of financial regulation.
 - Second, that one of the principal purposes of the existence of carbon markets is to create price discovery for the cost of greenhouse gas emissions and to redirect as much traditional finance as possible towards investments that fund climate mitigation and adaptation. Traditional finance is unlikely to move to carbon markets if such

markets have volatility and unpredictability of the sorts seen in crypto markets. So, the risk for the carbon markets becoming too directly associated with crypto markets is that of being tainted by association. Voluntary carbon markets today are not ‘centralised’ in the way many financial markets are. For instance, Standards create different COUs and a challenge for the voluntary carbon markets today is to reduce fragmentation so as to create better liquidity and price transparency. The issuance of different and unique carbon tokens will not aid in resolving the challenge above.

Digital Identity – AML/CFT issues and market manipulation

- As noted by the Organisation for Economic Co-operation and Development (**OECD**), in relation to tokenisation, “[w]ider issues around identity and the management of digital identity at scale will also need to be addressed.” Digital identity can be looked at from various angles, including (i) data protection and storage, (ii) AML/CFT perspectives, and (iii) market positions.
- When considering the applicability of carbon tokens to scale the sources of carbon finance into voluntary carbon markets, the following points may be worth noting:
 - In respect of carbon tokens, there may be no clear mechanism to prevent, for example, ‘wash trading’ and other market manipulation techniques. Without a unified approach to digital identity, participants can artificially affect the price of a digital asset (such as carbon tokens)

through such techniques when traded in the DLT environment.¹⁹

- AML/CFT risks are high in relation to public or permissionless networks, especially when the protocol allows for their users to remain anonymous.²⁰ The Financial Action Task Force (**FATF**) has recommended that “[t]o manage and mitigate the risks emerging from virtual assets, countries should ensure that virtual asset service providers are regulated for AML/CFT purposes, and licensed or registered and subject to effective systems for monitoring and ensuring compliance with the relevant measures called for in the FATF Recommendations.”²¹ In particular, in their interpretative note, the FATF has called for virtual asset service providers to be “licensed or registered” and “identify, assess, and take effective action to mitigate their money laundering, terrorist financing and proliferation financing risks”.²² Even if a carbon token issuer or intermediary does not fall within the definition of a ‘virtual asset service provider’ above, they should take heed of the recommendations. This is particularly so if the Standards themselves are subject to certain AML/CFT compliance obligations.
 - The append-only feature of DLT is at odds with the ‘right to be forgotten’ in some jurisdictions.

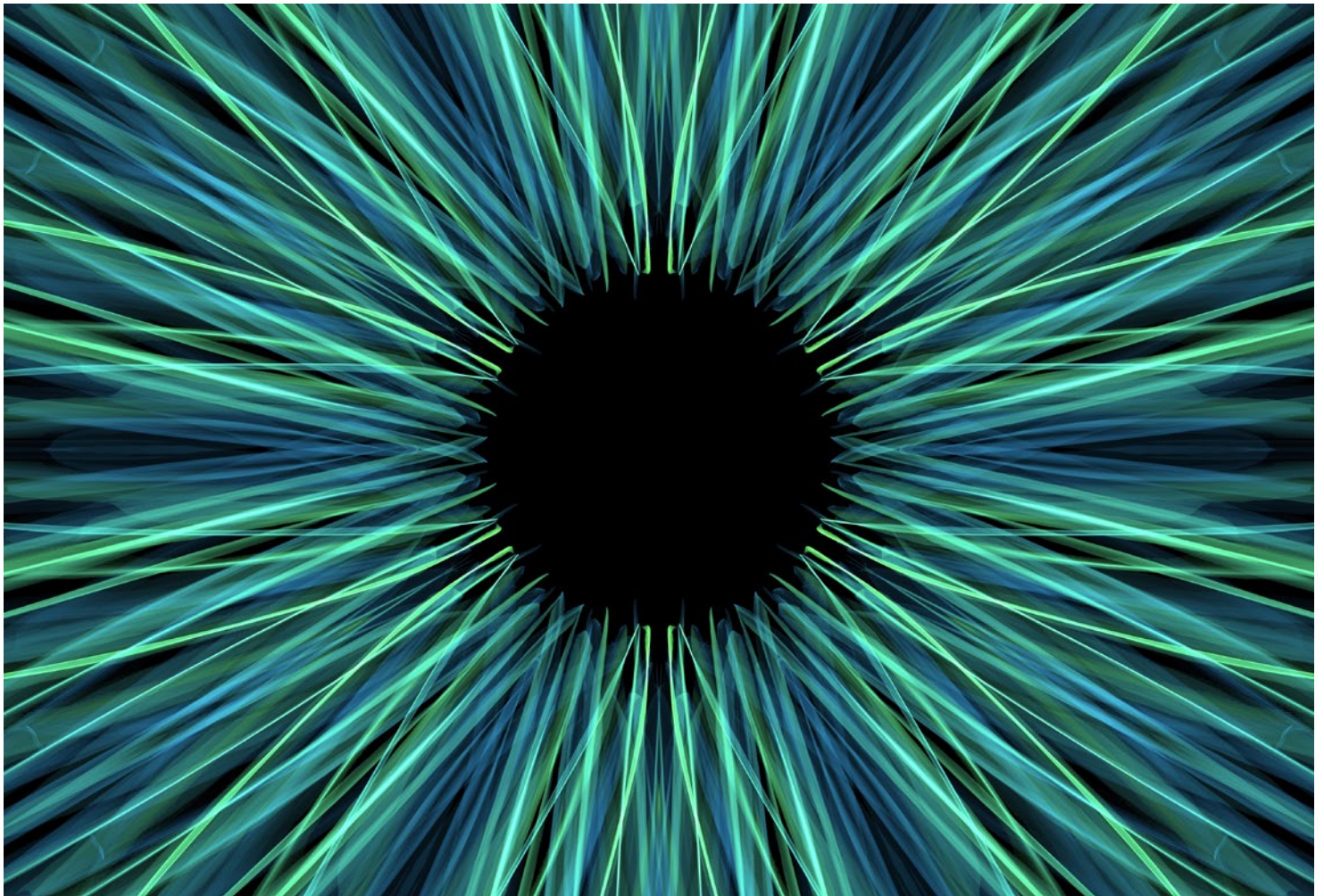
18 **What is a stablecoin and why is tether central to the global crypto market?** (Financial Times, 13 May 2022) (last accessed 15 June 2022).

19 **OECD, The Tokenisation of Assets and Potential Implications for Financial Markets** at 2.4 (last accessed 15 June 2022). (“**OECD Tokenisation Paper**”).

20 Ibid.

21 **FATF, International Standards on Combating Money Laundering and the Financing of Terrorism & Proliferation: The FATF Recommendations** (last accessed: 15 June 2022).

22 Ibid at Interpretive Note to Recommendation 15.



A deeper dive into carbon tokens – the premise

In this section, we discuss the rationale for why and how we have broken down the fundamental question of ‘what is a carbon token’ into various subcomponents.

In our view, there are a number of important questions that arise when conceptualising a carbon token. These include:

- To the extent that a carbon token is a representation of or linked to a COU, what is the relationship between the COU and the carbon token?
- The choice of DLT technology and whether it is permissioned or permissionless.
- Does the carbon token constitute property?

However, before we get into that detail, we first discuss why these questions are important.

Given the potential real-world connection between a DLT carbon token and a COU, it is crucial that market participants understand the nature of the carbon token that is being issued, and what rights they may acquire as a token holder. This applies for any product which one purchases but we argue this is particularly acute in relation to carbon tokens. In some ways, DLT-based tokens and COUs each represent a complex world and the point of intersection of the two (i.e. carbon tokens) may result in complexity-squared. If ‘sunlight is the best disinfectant’ – then in our view, these complexities can be broken down and made more understandable through

disclosure and the dissemination of information to ensure that market participants are fully informed of the consequences of their choices.²³ A carbon token, which is intended to be substantially the same as a COU, may need to be considered differently from a carbon token that acquires only certain attributes of a COU or is intended to be related but not the same as a COU. This is important not only for persons who acquire carbon tokens, but also for persons interacting with such token holders (e.g., financiers and potential acquirers).

For the avoidance of doubt, this article does not intend to flag all of the issues which could arise in relation to the tokenisation of COUs but rather to provide some initial thoughts for parties to consider.

²³ We note that there remains a general philosophical debate as to whether disclosure or intervention would be the best way in which to regulate the securities market: see e.g., Dimity Kingsford Smith & Olivia Dixon, “What next for the financial consumer: more disclosure? Caveat vendor? FinTech online?” in Geraint Howells, Iain Ramsay & Thomas Wilhelmsson *Handbook of Research on International Consumer Law*, 2d ed (2018) at 383 et seq

Understanding what a carbon token represents

In this section, we consider what a carbon token represents vis-à-vis (i) the relationship between the COU and the carbon token, (ii) third parties (such as custodians), and (iii) any fraction of a COU.

To the extent that a carbon token is a representation of or linked to a COU, what is the relationship between the specific COU and that carbon token? For instance, does a carbon token represent, in its purest sense, a COU but simply in a digitalised form (a **Direct Representation**) or is it a 'derivative'²⁴ representation of a COU, e.g., a claim in a pool of retired COUs or even a share in the proceeds from the sale of COUs (a **Derived Representation**)?

Direct Representation

- To the extent that a carbon token is intended as a Direct Representation, such a representation would need to be consistent with the rules of the Standard which the COU is issued by. For instance, would the registry or Standard's consent be necessary for such a carbon token?²⁵ Verra and Gold Standard now require this.
- The corollary to the above is the relationship between the rules of the Standard and carbon token. For instance, to the extent that the COUs are issued off those with permanence-considerations, if it is possible, how are cancellations and reversals of COUs by a Standard effected at the level of the carbon token? Further if a carbon token includes additional attributes (such as labels) that are attributed to the COU to which it relates, how should a change of the registry or Standard's rules in relation to such attributes be dealt with?
- The nature of the Direct Representation must be unambiguous. If a carbon token is represented to be akin to a COU, a token holder may assume that its rights are akin to that of a COU holder. If this is not the case, then such deviations should be made clear to the token holder. For instance, is the carbon token holder entitled to request the token issuer (or its nominee/designee) to retire the underlying COU? If retirement is allowed, what are the token issuer's (or its nominee/designee's) obligations in relation to the COU, and the carbon token holder's rights in relation to the carbon token? IETA, for example, has recommended that claims relating to carbon neutrality, offsetting, and/or compensation of emissions shall only be made after the token is permanently removed from circulation (by 'burning' it on the blockchain) and the underlying COUs have been retired.
- Considering the heterogeneity of COUs, e.g., COUs from multiple Standards, project-types, and vintages, how is such heterogeneity considered or resolved for the purposes of the carbon token? If a carbon token is simply a direct representation of a particular COU, the token holder may assume that the token is similar to a COU. Similarly, a token issuer needs to be careful of the promises that it makes to the token holder; care will have to be taken, for example to the extent that the Standards have varying conditions that apply towards making offsetting claims. Insofar as the differences exist at the carbon token-level (e.g. to make the carbon token more liquid and fungible) as compared to COUs, what is the impact of such deviation on the Direct Representation?
- If COUs are considered regulated products in certain jurisdictions²⁶ (or if carbon tokens become subject to regulation), then to the extent that the carbon tokens are Direct Representations, a token issuer will also need to consider the regulatory impact of issuing such Direct Representation carbon tokens.
- To the extent that a holder of a carbon token is deemed to have legal interests in respect of a specific COU, is the transfer of the carbon token effective to also transfer that legal interest in the specific COU? Do the applicable laws support such an approach?

Derived Representation

- As with a Direct Representation, a Derived Representation would need to be consistent with the rules of the Standard from which the COU is an intended derivative of and take into account the interaction between the carbon token and the rules of the Standard. For instance, Standards have restrictions on claims being made off retired COUs. We note further that IETA has recommended as part of its Guiding Principles that tokens should be minted only for issued, ex-post verified COUs, not cancelled or retired COUs.
- To the extent that a carbon token is a Derived Representation, its specific nature will have to be further considered. For instance:
 - Insofar as a carbon token provides its holder with rights and obligations similar to

²⁴ We use the word 'derivative' here not to mean products such as futures or forwards, but rather products that are based on or derived from COUs.

²⁵ See e.g., Verra 2021 Statement

²⁶ See e.g., Rosin Behnam, chair of the Commodity Futures Trading Commission who has stated that "[i]f an asset is not a security then it is a commodity. These credits from the registries are commodities" and has suggested that from "a legal perspective, a carbon market would fall under the purview of the CFTC" ([Jeremy Chan, FCA warns greenwashing risks trust in \\$1bn carbon market as firms race to net zero](#) (13 May 2022) (last accessed 15 June 2022)).



securities²⁷ there may be regulatory considerations for both the token issuer and the token holder.

- If not a security, is a carbon token a property right and, if so, what type of property right is it? Can security be granted on that token, and what laws determine such questions?

Need for a trusted third party

- Insofar as a carbon token is capable of being used in the 'real world', whether indirectly after it has been issued and or because of recognition by a Standard or real world market participant, (in particular in a Direct Representation context), it is likely that a trusted third party will be required to act as the custodian or guardian for the connection between the 'on-chain' and the real-world environment, for example, to provide the backing for the carbon tokens issued that are meant to represent the COUs.²⁸ Similar considerations could apply in a Derived Representation context, but the precise role for that trusted third party will vary according to the type of derived product.
- The relationship then between the token holder, the token issuer and the trusted third-party will have to be clarified, including

each of their respective rights and obligations. For instance:

- what guardrails should be in place to align the interests of the third party with those of market participants?
- how does one ensure the accuracy of the information around the COUs which are tokenised into carbon tokens (i.e. at the on-boarding stage)?
- where should losses lie where there is loss or theft of COUs or carbon tokens, whether due to a technical failure of the network, malicious activity by third parties, or the rules of the Standard that allow the Standard to revoke or cancel issued COUs (e.g. for fraudulent/erroneous transactions)? This concern may also extend to the appropriate consensus algorithm for the DLT system.

Fractionalisation

- One of the potential benefits of a carbon token is that a fraction of such a token could possibly be transacted between persons, e.g., 0.1 of a carbon token. In the context of tokens generally, fractionalisation has been touted as potentially “*allow[ing] more inclusive access of small and retail investors to somehow restricted asset classes, while*

enabling global pools of capital to reach parts of the financial markets previously reserved to large investors”.²⁹ In the context of COUs, this could spur the development of more retail climate mitigation and adaptation activities. Further, to the extent that a Standard's registry restricts the creation of accounts for individuals, carbon tokens (and their fractionalised parts) represent a way in which an investor can gain access to this asset class.

- However, from a legal and practical perspective, market participants should consider whether fractionalisation is viable for the carbon token that they are structuring. For instance, if retirement of a COU is allowed in respect of a carbon token, then to the extent that a Standard requires retirements to be done in whole numbers, there may need to be similar restrictions being introduced in the architecture of the carbon token or infrastructure developed to address this challenge. This may be less acute in relation to carbon token based on a Derived Representation, where the subject matter of the token is more abstract and further removed from the COU itself and therefore more amenable to the idea of fractionalisation.

27 E.g., 'specified investments' under the Financial Services and Markets Act 2000 of the United Kingdom.

28 OECD Tokenisation Paper at 3.5.

29 OECD Tokenisation Paper at 2.3.

“There is an expectation by token holders that their indirect rights in the real world assets, as represented by the DLT entries, are protected and enforceable by the law.”

What is the DLT being used?

In this section, we look at the considerations about the DLT system being used for the architecture of the carbon token, such as environmental considerations and the ‘synchronisation conflict’ (as discussed below) in respect of permissioned and permissionless DLTs.

Environmental considerations

- Market participants will be conscious about the carbon footprint of the DLT system itself arising from the process of the creation of the carbon token.³⁰ IETA has stated that any digital technology deployed “*must be truly sustainable*” in that “*it must be inclusive, open, resilient and secure as well as have a low carbon footprint*”. Environmentalists have for some years highlighted the energy-intensive computer processes used in “Proof of Work” blockchains such as that which Bitcoin runs on, which utilise algorithmic calculations in order to secure the network and confirm transactions.

However, this is not necessarily the most representative yardstick by which to measure modern blockchain technology by, and the technology has come a long way since 2010.

- Modern blockchains may utilise a far less energy-intensive ‘Proof of Stake’ system to secure their network (although this is generally considered to be less secure than a ‘Proof of Work’ system).³¹ Other forms of technology, such as choosing the most appropriate ‘Layer 0’ infrastructure on which the chosen blockchain exists, or the adoption of suitable ‘Layer 2’ solutions (which may be applied to a ‘Layer 1’ blockchain) may significantly reduce energy required to confirm transactions. All in all, given the context of a token linked to the voluntary carbon markets, the choice of DLT deployed must be a relevant consideration when choosing the framework for carbon-linked DLT products such as carbon tokens.

Permissioned versus Permissionless

- One of the common architectural considerations is whether a permissioned or permissionless

DLT should be used.³² In a permissioned DLT system, only authorised participants are allowed to join the network and a central authority grants participants access, rights to read, write or validate transactions. For example, only a limited number of approved network participants can validate transactions and propose updates to the ledger. On the other hand, for permissionless ledgers, anyone can join the network and participate in validation of transactions.

- The choice of DLT system will have knock-on effects, in particular on how and to what extent the ‘real-world’ is mirrored in the DLT. Edmund Schuster has noted the concept of a ‘synchronisation conflict’, i.e. “[a] situation where the allocation of assets, as seen through the lens of the law, deviates from what the blockchain record reflects”. This is premised on the idea that a ‘real-world’ legal system should ultimately determine how contractual and property rights are attributed, in particular, in light of the restrictions under general law on what can be contractually agreed to. Given the complexity in encoding the entire legal system

30 See e.g., Gillian Tett, [Crypto cannot easily be painted green](#) (Financial Times, 7 January 2022) (last accessed 15 June 2022).

31 Consider also the ‘proof of space and time’ algorithm as discussed in the [Chia FAQ](#).

32 OECD Tokenisation Paper.

into machine-executable code, code, parties need to consider whether to accept that there will be a synchronisation conflict or to find a way in which to implement decisions of the court in the DLT system, in particular relating to *“transfers, or other transactions carried out in accordance with the code governing the blockchain protocol, but deemed unacceptable by the applicable law”*.³³

- Applied here, given that the COUs are real-world assets, the very structure chosen, permissioned or permissionless, will have to balance and consider how this synchronisation conflict is managed. There is an expectation by token holders that their indirect rights in the real world assets, as represented by the DLT entries, are protected and enforceable by the law. For instance, how should void or voidable transactions (as a matter of law) be dealt with in the chosen DLT-system for the carbon token? Would an equal and opposite transaction (though not a true reversal) be acceptable? What happens if the carbon token has already been transferred to a third party? Given (i) the decentralised nature of permissionless DLT systems and (ii) in particular the concept of decentralised consensus, having an entity (be it judicial bodies or other state or international entities) become a ‘super-user’ to ‘synchronise’ vitiates the rationale for using a permissionless DLT in the first place. The innate hierarchical nature of a ‘ruling’ could potentially be replicated through a reversal made through the decision of a DAO that decides to implement a judicial ruling, but to the extent that this is not the case, market participants will need to consider how best to manage the risks that are inherent here.”



33 Edmund Schuster, [Cloud Crypto Land](#) (LSE Legal Studies Working Paper 17/2019) (last accessed 15 June 2022).

“The UK Jurisdiction Taskforce have concluded that ‘cryptoassets’ possess all the characteristics of ‘property’ as set out in the relevant legal authorities.”

Does the carbon token constitute ‘property’?

In this section, we consider whether a carbon token itself could be considered ‘property’. This is far too complex to be fully examined in a paper of this length but we endeavour to provide a snapshot of the issues here. In our view, and if properly constructed, a carbon token could have greater legal certainty in respect of the nature of the carbon token as ‘property’ in contrast to the legal nature of some COUs.

To elaborate, given that COUs are generally constituted outside of statutory frameworks and only by way of contractual arrangements with, amongst others, the direct users and the relevant Standard, specific consideration will need to be had as to whether the COUs for each Standard are ‘property’ per se. ISDA has suggested that COUs “*can be viewed as an intangible asset,*

evidenced by the register entries and established in accordance with the relevant carbon standard and registry rules” but have noted that the question of whether COUs are a form of ‘intangible property’ will, pending a global standard, remain “*a jurisdiction-specific question*” and “*answered by reference to national laws*”.³⁴ Regard will have to be had as to whether the COU itself is a property right without conflating a ‘record’ and a ‘claim’.³⁵

In the context of carbon tokens, carbon tokens themselves may nonetheless be considered ‘property’ regardless of (i) the legal characterisation of the COUs are property or not, and (ii) whether the carbon tokens are a Direct Representation or a Derived Representation of a COU. From an English law perspective, the carbon tokens themselves would have to satisfy the legal indicia of ‘property’. For instance, the UK Jurisdiction Taskforce have concluded that ‘cryptoassets’ possess all the characteristics of ‘property’ as set out in the relevant legal authorities.

Many implications follow from

the question of whether a carbon token is ‘property’. For example, the traditional position under English law has been to apply the law of the country where the property is situated at a relevant time (the ‘lex situs’ approach) in respect of issues such as the classification of the carbon token, how and whether a proprietary security or interest or other interest exists, and how and when a transfer of property affects third parties. For carbon tokens that are issued using **permissioned** DLTs, the UK Jurisdiction Taskforce has suggested that the ‘lex situs’ may be the country where central control is held (i.e. an ‘artificial location’ applied as a matter of law to establish the governing law on proprietary dealings of some intangible assets).³⁶ For carbon tokens that are issued using **permissionless** DLTs, the position as to what is the most appropriate law to govern issues relating to interests in property is less clear. All in all, market participants should consider this as part of their structuring the legal interests that arise in respect of their carbon token whether as a Direct Representation or a Derived Representation.

34 ISDA, [Legal Implications of Voluntary Carbon Credits](#) (December 2021) (last accessed 15 June 2022).

35 Kelvin Low & Eliza Mik, [Pause the Blockchain Legal Revolution](#) (June 2019) (last accessed 15 June 2022).

36 See e.g., UK Jurisdiction Taskforce, [Legal Statement on Cryptoassets and Smart Contracts](#) (London: The LawTech Delivery Panel, 2019) (last accessed 15 June 2022) at [94]-[95]. There are perhaps additional factors to consider (whether in a permissioned situation or otherwise), e.g., what is ‘central control’ and whose control is relevant? What if tokens are held on the servers of an exchange? Does the analysis change if the tokens are held by individual liquidity pool providers in DEXs? Consider also a situation where there are problems with blockchain node confirmations, and the nodes are in 30 different jurisdictions?



Market considerations in relation to carbon tokens

In this section, we consider what market participants should be aware of in respect of the ‘real-world’ voluntary carbon markets as a result of them being taken out or ‘locked-up’ as carbon tokens, including on liquidity and price signals.

If the issuance of carbon tokens involves ‘locking up’ COUs, these COUs are in essence taken out of the available supply within the ‘real world’ until the carbon tokens are ‘converted’ back to COUs (including for retirement purposes). As noted by the OECD, the tokenisation of assets can be a double-edged sword with both positive and negative implications on liquidity. Tokenisation of illiquid assets or assets with limited liquidity can provide liquidity to such asset classes. In the context of the voluntary carbon markets, the TSVCM has noted in its Phase 1 report

that liquidity is fragmented due to heterogeneity in the COUs (and their underlying projects). Depending on how they are structured, carbon tokens could create larger liquidity pools for investment in emissions reductions. Conversely, tokenisation can also create a bifurcation of liquidity between on-chain and off-chain markets for the same asset with negative implications on liquidity conditions and the potential heightened risk of arbitrage.³⁷ Depending on the interoperability and communication between on-chain and off-chain markets for tokenised assets, the benefits or detriments will turn on the use to which the carbon tokens are put. This may turn on how the carbon token is structured and its supporting infrastructure.

Attracting capital from the ‘on-chain’ environment to the real-world carbon environment is a good concept but if it leads to confusion around the market price for a COU,

a good concept can lead to a bad outcome. There are two elements to this: (i) whether carbon tokens would have different price signals from COUs and (ii) whether greater price transparency is achieved in an on-chain environment.

For the first aspect, in its purest sense, a Direct Representation carbon token could conceptually be the same as that of its corresponding COU. However, the pricing of such a carbon token may not be the same as that of a COU for a number of reasons. For instance, (i) to the extent that the carbon token is more fungible than a COU, (ii) a carbon token can be transferred to a person (including a natural person) without the burden of maintaining a registry account with the Standard, and (iii) depending on how it is created, a carbon token may have proprietary rights associated with it that the underlying COU itself lacks,³⁸ such attributes may invite a premium in the market. Similarly, if there are

³⁷ OECD Tokenisation Paper at 3.2.

³⁸ See our discussion above on the nature of a carbon token (e.g., whether it is ‘property’).

“Attracting capital from the ‘on-chain’ environment to the real-world carbon environment is a good concept but if it leads to confusion around the market price for a COU, a good concept can lead to a bad outcome.”

costs which may have to be incurred (for instance ‘gas’ or transaction fees to facilitate a new transaction on the DLT or to convert a carbon token back to its corresponding COU), such costs will have to be factored in. Consequently, market participants will have to understand the nature of the carbon token in order to better price such a carbon token as against existing COU pricing benchmarks. The more novel the carbon token, the less likely there will be pricing signals for that carbon token’s attributes by reference to the underlying COU itself. This may be more acute for a Derived Representation carbon token where the attributes may not be as easily understood by or already available in the market, thus making price discovery more complex. The tokenised carbon markets will need to develop transparent, clear and available mechanisms to aid market participants in determining the price

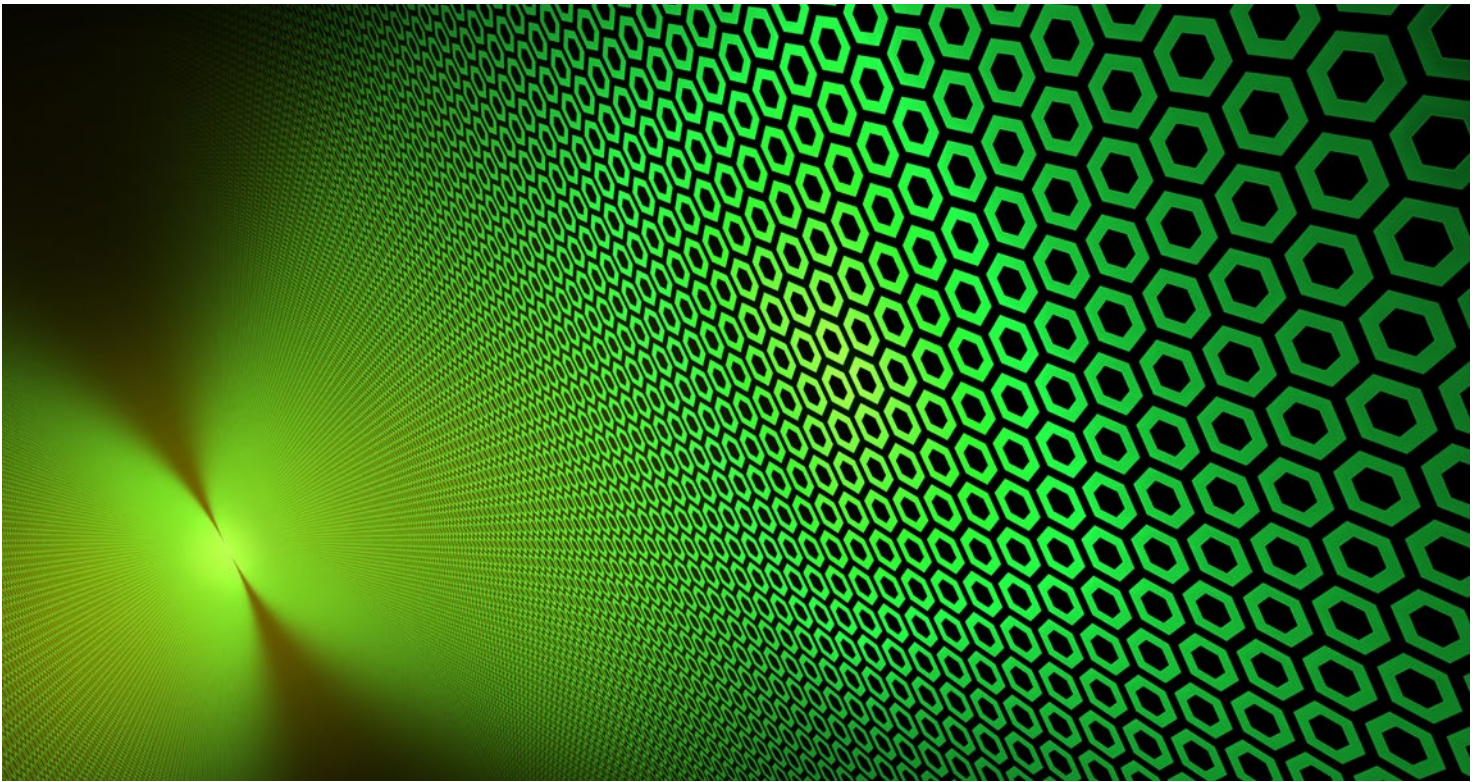
of a carbon token. Industry groups such as IETA could take the lead in developing guidelines or principles in doing so.³⁹

For the second aspect, one of the challenges for the voluntary carbon markets is the lack of price transparency for COUs.⁴⁰ It has been suggested that in respect of securities, the distributed nature of DLT allows multiple copies of the same pricing queue to be held simultaneously by a large number of order-matching platforms, curing the problem where multiple platforms on which trades in the same security are matched have separate bid/ask queues and are not consolidated in real time.⁴¹ Similar applications could apply in respect of the voluntary carbon markets.

39 Although price transparency mechanisms are not referenced directly in IETA’s press release: [IETA Council Task Group on Digital climate markets – Key findings and recommendations](#) (28 March 2022).

40 See e.g., [Jared Anderson, “Global carbon markets need price transparency, rule harmonization to mature”](#) (24 September 2020) and [Camilla Hodgson, “Surge of investment into carbon credits creates boom time for brokers”](#) (2 May 2022)

41 [David C. Donald & Mahdi H. Miraz “Multilateral Transparency for Securities Markets through DLT”](#) (2020) 25 *Fordham J. Corp. & Fin. L.* 97 (last accessed 23 June 2022).



Broader considerations in relation to DLT that apply equally for carbon tokens

Lastly, in this section, we consider the issues that broadly apply to DLTs that we think would equally apply in the context of DLTs supporting carbon tokens, e.g., the concept of ‘immutability’ and its exceptions, and issues relating to governing law and dispute resolution.

Immutability

DLT systems have been described as being “immutable” and “tamper resistant and tamper evident”.⁴² There are exceptions to the rule, e.g., permanent exceptions in relation to a hard fork and temporary ones such as random temporary forks in ‘proof-

of-work’ blockchains.⁴³ A market participant will need to consider how this would affect the transactions made between them, e.g., what is the relevant point in time when delivery of a carbon token is deemed ‘complete’ under the relevant DLT system, and where does risk lie where a token holder no longer holds a token due to a blockchain fork.

Governing Law and Dispute Resolution

Generally speaking, English law allows parties to agree the applicable governing law for a transaction. To the extent that the DLT used is a permissioned DLT, the participation rules could specify the governing law. Absent such an agreement, there will be uncertainty as to what the governing law is given, in particular, the decentralised nature of a DLT.

In relation to dispute resolution, again, in the absence of express agreement, there will be uncertainty as to how parties intended for disputes to be resolved. This is complicated in the context of the anonymous nature of DLT accounts – for instance, this may complicate the question of whether the court finds that it is the most appropriate forum⁴⁴ and whether the rules relating to the service of proceedings on a counterparty need to be reconsidered.⁴⁵ Similarly, the way in which enforcement of arbitral awards or court judgments can be effected will have to be considered in each relevant jurisdiction,⁴⁶ and history has taught us that achieving any form of multilateral consensus on such issues is an extremely difficult and time-consuming process, most commonly years in the making.

⁴² World Bank Group, *Distributed Ledger Technology & Secured Transactions: Legal, Regulatory and Technological Perspectives – Guidance Notes Series* (May 2020) at 1.5 (last accessed 15 June 2022).

⁴³ It has been said that in such circumstances immutability is ‘highly attenuated’ and transactions gain immutability over time especially in respect of proof-of-work blockchains: Kelvin Low & Eliza Mik, *Pause the Blockchain Legal Revolution* (June 2019) (last accessed 15 June 2022).

⁴⁴ See e.g., the discussions on forum in *Tulip Trading Ltd v Bitcoin Association For BSV & Ors* [2022] EWHC 667 (Ch).

⁴⁵ See e.g., the Singapore case of *CLM v CLN and others* [2022] SGHC 46 where the court gave leave for service by way of email because, amongst others, “it was impractical to serve the cause papers in the present action on the fourth and fifth defendants personally, as their physical whereabouts are presently unknown. Moreover, it was unlikely that they would agree to come forward to accept service willingly.” (at [79]).

⁴⁶ See e.g., the discussions on equal and opposite transactions.

Conclusion

It is important to note that a focus on COU tokenisation should not obfuscate the existing concerns about some COUs. For instance, should strict criteria apply to the COUs that are brought on-chain, given criticisms about certain COU projects being fraudulent⁴⁷ and not having 'additionality'? These are questions that market participants will have to consider. For the avoidance of doubt, these are not points directly linked to tokenisation per se but relevant when determining normatively what types of carbon tokens should be supported by market participants.⁴⁸

Nonetheless, we are of the view that transparency, disclosure and clarity are key here. The underlying issues and concerns about carbon tokens (including those discussed in this article) should be made known to investors and market participants alike. The highly jargon-filled voluntary carbon markets being combined with the equally jargon-filled crypto and DLT markets, are a recipe for obfuscation and subterfuge in the hands of bad market actors. This therefore requires market participants to collectively enhance understanding of this still nascent space. Yet, failing to carry out proper due diligence is no excuse for naivety or ignorance on the part of the investor. However, if behaviour is allowed to go unchecked, as Governor Waller said, *"the main reason, ... that society wants to regulate new and poorly understood markets for financial product[, is] not to protect high-net-worth investors but to protect society from the often-irresistible pressure to socialize the losses of investors with limited*

resources, and to limit the spread of financial stress"⁴⁹. The danger for the voluntary carbon markets is that it brings regulation upon itself through its association with, amongst others, poorly structured and ill-considered tokenised carbon offset products. It will be important for the market to identify and distinguish carbon tokens that are carefully structured and bring utility to the market from those which have not been so well thought through, or have limited market utility.

Lastly, if the fundamental aim here is to direct money towards doing 'good' (in particular in protecting and enhancing the environment), we should not lose sight of this goal in the creation and pursuit of carbon tokens. As put by Gold Standard, *"[d]one right, tokenisation can increase access to carbon markets, create a better record of transactions, and when used with smart contracts, digital MRV systems and good governance it can create trust in areas lacking proper governance and help narrow the gap between those creating the impact and those who wish to support, sponsor or fund it. Done poorly, it can be a wasted use of a distributed ledger technology (and the associated energy requirements), or worse, a scam."*⁵⁰ The appropriate balance between risk and opportunity will ultimately have to be determined and struck by the market. In our view, the risks can only be assuaged by carefully considered and structured carbon token products which may unlock the opportunities represented by DLT.

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⁴⁷ Lisa Song, *An Even More Inconvenient Truth: Why Carbon Credits for Forest Preservation May Be Worse than Nothing* (May 2019) (last accessed 15 June 2022).

⁴⁸ See e.g., the work being done on the *Core Carbon Principles* to "set new threshold standards for high-quality carbon credits, provide guidance on how to apply the CCPs, and define which carbon-crediting programs and methodology types are CCP-eligible".

⁴⁹ Governor Christopher J. Waller, *Risk in the Crypto Markets* (June 2022) (last accessed 15 June 2022).

⁵⁰ Gold Standard, *COMMENT: Blockchain for better: Untangling tokenisation and carbon markets* (8 March 2022) (last accessed 15 June 2022)

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