

Verdana

A Verdana White Paper On An Immutable Data Chain From Remote Carbon Footprints To Authorized Stakeholders

The Verdana Blockchain SaaS Platform

An immutable data chain from remote carbon footprints to corporate stakeholders & carbon offset certifiers



Objective: *Restoring Credibility To The Carbon Trade*

Carbon Cap & Trade was kicked-off by the UN sponsored Kyoto Protocol in 1997.

By 2006, its credibility was already in question. By 2021, the carbon trade was a \$800 billion business with no commensurate reduction in greenhouse gases. One fallout from this is that a large volume of UN certified carbon offset credits (CERs) are deemed of doubtful origin and unable to find buyers. 54% of such CERs from Indian companies, for example, are deemed fraudulent. *This credibility issue burdens every carbon capture/sequestration project hoping to honestly monetise it's efforts through sale of carbon offset credits.*

While participant nations wrestle with this matter and with each other, the voluntary market has stepped in to fill real, as well as greenwashing needs of the corporate sector. They haven't fared any better at resolving the core problem: *how to ensure that a Green House Gas (GHG) report accurately reflects the state of a remote carbon footprint, or that a carbon credit claim is genuine.* The carbon trade's state of affairs is eloquently spelled out by [John Oliver on his HBO show](#).

All that notwithstanding, US\$64 Billion of new money was made available in 2022 for Climate related businesses (<https://www.ctvc.co/new-dry-powder-for-a-new-climate/?ref=CTVC-newsletter>). It is the new frontier. Climate deals will keep happening in spite of the current market backdrop. Much of this money will end up in greenwashing projects that do not contribute to any GHG reductions.

Clearly, now more than ever, we need to understand how to navigate in this landscape. How to accurately report on our carbon footprints. How to get our carbon offset claims properly validated so they fetch top dollar when sold to an offset buyer. How to ensure the carbon offsets we are buying are genuine and have actually reduced a commensurate amount of GHG in the atmosphere.

Investors of course want to ensure their investment is in genuine projects and not being greenwashed. Projects claiming carbon credits want to maximise selling price. Certifying Registries and offset Purchasers want to ensure that carbon credit claims are genuine. These requirements have created a US\$10 Billion Carbon Footprint Management market that's projected to reach US\$13.7 Billion by 2028, growing at a CAGR 6.1% from 2021 to 2028 (Vantage Market Research).

Verdana believes, *the best way to restore credibility to the carbon trade is to digitise its pain-points*. Towards this end, Verdana provides dMVR (digital Monitoring, Verification, Reporting) over an immutable data chain from remote carbon footprints, to authorised stakeholders including management, auditors, verifiers, government authorities, certifying carbon registries and carbon exchanges. This unique end-to-end automation enabled by Verdana's *Blockchained SaaS Platform* brings credibility back to the carbon trade and is laid out in this White Paper.

Terminology:

Additionality: The concept of additionality requires that only credits from projects that are "additional" to the business-as-usual scenario may be certified as genuine. Therefore, credits cannot be awarded against activities that would have happened anyway (see 2.1 below).

AMM: Automated Market Makers protocols are smart contracts on the Ethereum Blockchain which automatically offer a price for the exchange of digital assets.

CER: or Certified Emission Reduction, is the term used for the carbon offset credits issued under the UNFCCC's CRM (Carbon Reduction Mechanism) process, following the Kyoto Protocol.

Carbon Emitter: For the purposes of this White Paper, this is an entity, typically a manufacturing enterprise, seeking to manage its carbon footprint and provide GHG reports to various internal and statutory stakeholders.

Carbon Offset Credit: is a tradable certificate issued by government or self-regulated carbon certification bodies and is a unit of CO₂e in tons that a person or organization creates by decreasing their carbon footprint or reducing a commensurate amount of GHG gases in the atmosphere below their allocated quota. A carbon offset credit gives the purchaser the right to emit a unit of CO₂e in tons and is traded as part of the compliance, or cap & trade, market (as against the voluntary market). For the sake of simplicity, in this white paper we use the term Carbon Offset Credit for both, the compliance as well as voluntary markets since the underlying principles involved remain the same.

Credit Holder: An entity that earns Carbon Offset Credits

Project Developer: synonymous with Credit Holder. The project owner can reduce the amount of emissions that it has been given as a cap and thus create Carbon Credits for the compliance market. In a similar manner a project owner can also create Carbon Offset Credits by virtue of removal of carbon emissions. These credits earned can then be set off against the carbon footprint any organization (referred to as a Purchaser in this document) cannot reduce on its own.

VCC Token: Verdana's digitized equivalent of a Carbon Offset Credit.

VCC Holder: an entity who selects to digitize its credits into VCC Tokens.

Designated Consultants: Consultants authorised by registries or regulatory bodies in a particular region, or by the UNFCCC, to validate Carbon Offset Credits and Additionality claims made by Credit Holders & Project Developers.

Validators: same as Designated Consultants

Certifiers: The various compliance and voluntary market registries. They legitimize Carbon Offset Credit claims by Credit Holders/Project Developers/VCC Holders. They also verify that VCC tokens burnt are equivalent to burning a proportionate amount of emissions.

Purchaser: is an entity seeking to buy a Carbon Offset Credit from a Credit Holder, or a VCC Holder, or seeks to fund a Project Developer, with the intention of offsetting its own carbon footprint.

White Paper Abstract:

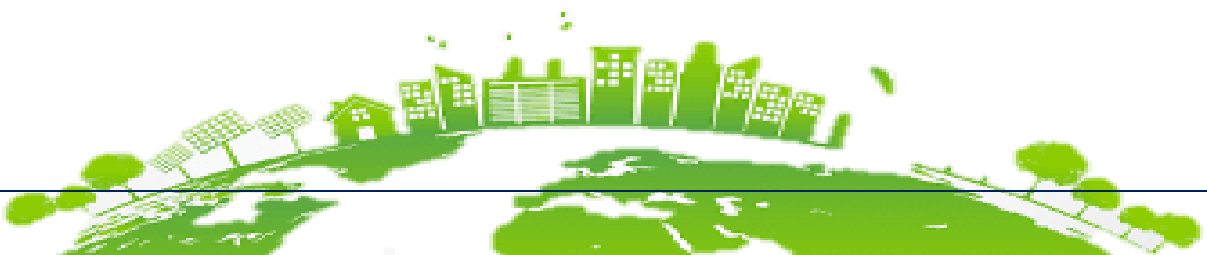
To get to the COP26 ask of no more than 1.5 degrees Celsius in global warming by 2030, at least 40% of all existing coal fired power plants would have to shut down. Clearly, not going to happen.

This white paper details the workings of a fully functional platform that provided end-to-end automation to facilitate accurate GHG reporting and trade in carbon.

Using an immutable chain to move raw & processed data from remote carbon footprints to stakeholders, validators, and certifying entities, Verdana assists reforestation projects, building complexes, utilities and manufacturing companies manage & report on their carbon footprint, as well as facilitating carbon trades. Verdana does the math & analytics around carbon footprints for any building, data centre, power utility (thermal or renewable), manufacturing company, or sustainable forestry program that connects to it. The cloud-based Software-as-a-Service (SaaS) system connects to a Blockchain to enable non-fungibility and facilitates carbon trading for all connected parties.

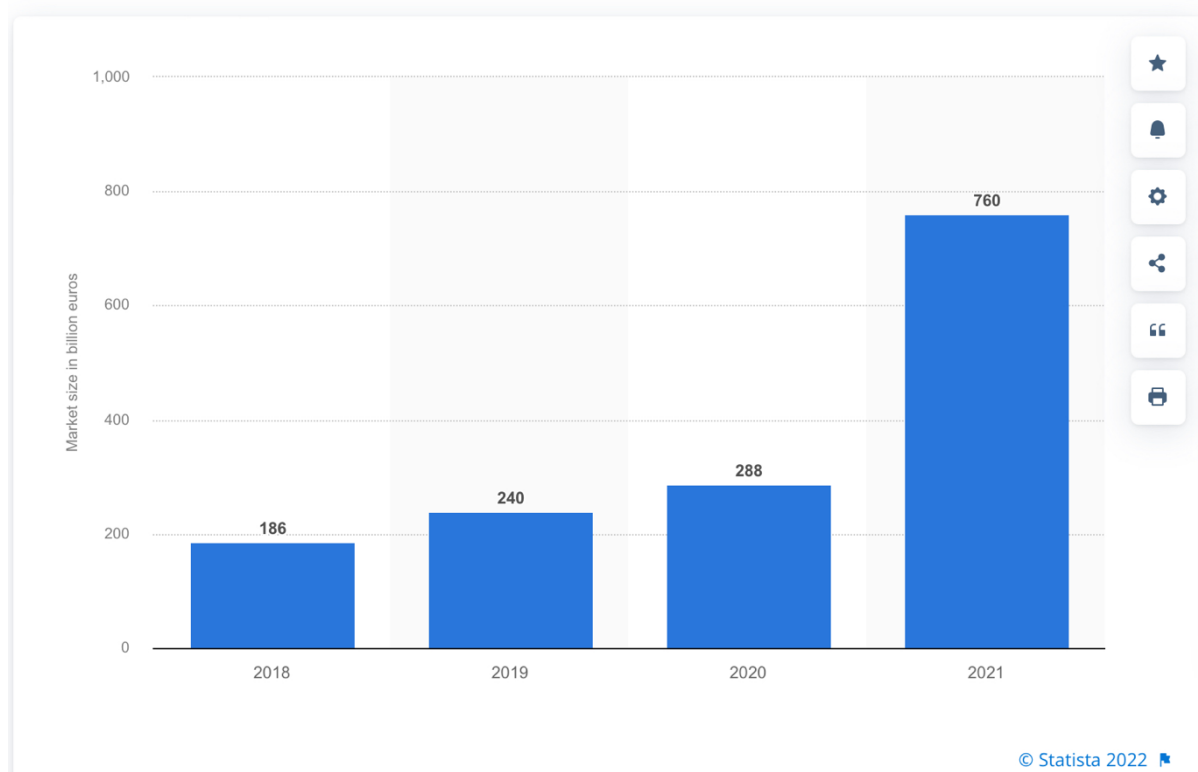
The registries and exchanges connected to the Blockchained SaaS platform can directly access the data & analytics from remote carbon footprints and certify compliance in creation of carbon offset credits. Connecting remote carbon footprints to a SaaS platform that is a node on the Blockchain, alleviates the difficulty in validating Additionality currently faced by the carbon industry where validation of remote and dispersed carbon footprints continues to be a significant challenge. On-going physical on-site inspections by designated third-party consultants is the prevailing solution and not an elegant one at that, as it is tedious, expensive, and open to *Additionality* bypass, double counts, conflicts of interests, etc. *The Verdana Blockchained SaaS Platform allows consultants and their associated registries to inspect & validate carbon related performances with minimal travel & human intervention.*

Essentially, the Cloud based SaaS platform provides a digitised tool for measurement of emissions. Additionally, the SaaS based tool allows users to access registries and carbon markets either directly or through the Blockchain. By using Blockchain, an organisation has a completely paperless and immutable transaction by leveraging a Blockchain's smart contract functionality.



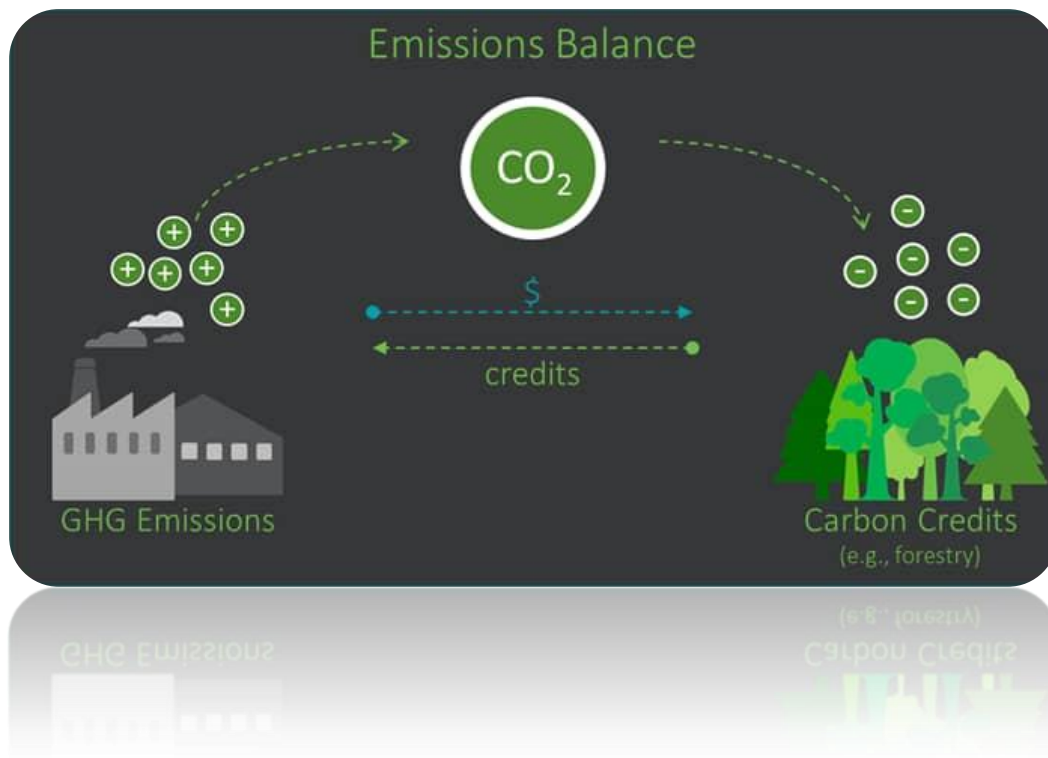
Value of the carbon market worldwide from 2018 to 2021

(in billion euros)



Background On Carbon Credits

Typically, we have two types of carbon credits: (1) Voluntary carbon offset credits being over-the-counter or voluntary market for 'offsets' (2) Compliance carbon offset credits: emission units (or credits) created through a regulatory framework with the purpose of offsetting an organisation's emissions.



1.1. Compliance Markets Versus Voluntary:

Compliance markets are created and regulated by mandatory national, regional, or international carbon reduction regimes. Voluntary markets typically function outside of compliance markets and enable companies and individuals to purchase carbon offsets on a voluntary basis and not necessarily intended to be used for compliance purposes. Rather, the voluntary offsets are used for trading or for being/ seen to be, responsible organizations and individuals. Unless explicitly accepted into a compliance regime, voluntary offsets are not allowed to fulfill compliance market requirements. Because compliance offset credits are driven by regulatory obligations and because they are 'officially' verified, their prices tend to be higher than offset credits issued solely for the voluntary market. However, proper validation of a seller's credit and its provenance in the voluntary market by a Verdana type platform, does help decide whether a premium is justified.

1.2. Carbon Credit Markets

The Kyoto protocol depended on market mechanisms to reduce greenhouse gas emissions (GHG) and laid out the rules and accounting methodologies for various carbon reduction projects. To make it interesting, Kyoto decreed carbon dioxide emission a commodity traded in a carbon trading system. The mechanism allows companies and individuals to reduce carbon emissions by purchasing carbon offset credits from organisation's whose carbon emissions are below the cap set by the regulator. *It is self-evident that the whole edifice rests on reliable validation of carbon offset credit claims.*

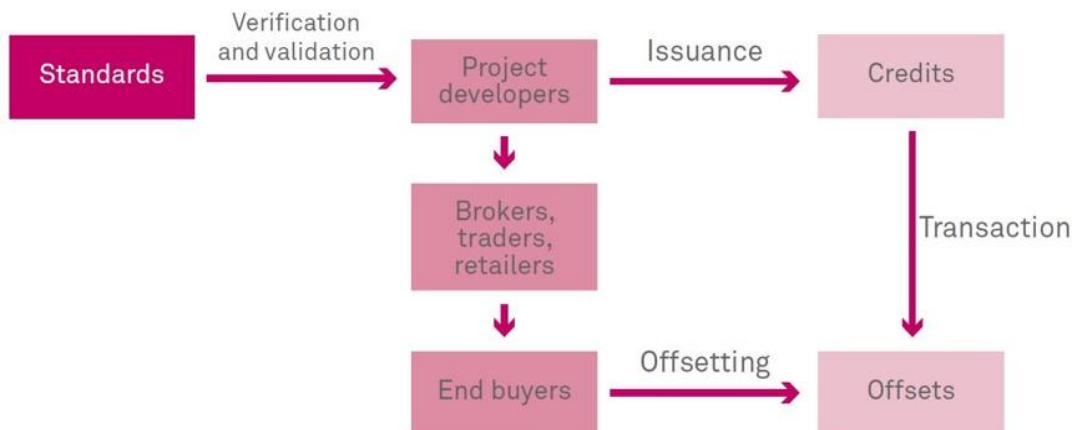
Over a period of time various other compliance trading systems have also come into being and COP26 has hastened the process.

The compliance market constitutes regulatory bodies to oversee the management of ESG, consultants for validation and verification) as well as the projects registered thereof.

For voluntary markets the management is delivered through:

- Registries (American Carbon Registry, Gold Standard, VCS etc) which then define the standards for the program and have designated consultants registered for quality assurance of the offset credits produced by the projects.
- Independent intermediaries who market the offsets to end buyers and provide consultancy for the project in line with various ESG guidelines.

Structure of the Voluntary Carbon Market



Source: S&P Global Platts

1.3 Additionality

This concept is basic to understanding the carbon trade and the in-built complexity. The GHG Management Institute tells us, “(Green House Gas) reductions are *additional* if they would not have occurred in the absence of a market for offset credits.” Please read about Additionality in their Carbon Offset Guide (<https://www.offsetguide.org/high-quality-offsets/additionality/>). They go on to say, “If the reductions would have happened anyway – i.e., without any prospect for project owners to sell Carbon Offset Credits – then they are not additional. Additionality is essential for the quality of Carbon Offset Credits – if their associated GHG reductions are not additional, then purchasing offset credits in lieu of reducing your own emissions will make climate change worse” (the underlining is ours). As such standards based certifications always ascertain that Additionality conditions are adhered to.

Background on Blockchains

2.1 What afflicts Carbon Offset Credits: When a commodity is invisible, frauds multiply. As mentioned earlier, the Carbon Trade is a \$100billion+ business but there’s been no commensurate reduction in greenhouse gases. Reasons include:

- Bypassing the Additionality requirement: every project developer has an incentive to argue their project meets the requirement for Additionality. However a large number fail to meet this quite simple but strict criteria. The CER scheme set under the Kyoto Protocol was disbanded solely because too many “validated” CER claims didn’t actually meet the criteria. A Carbon Offset Credit fraudulently or incorrectly earned without a commensurate

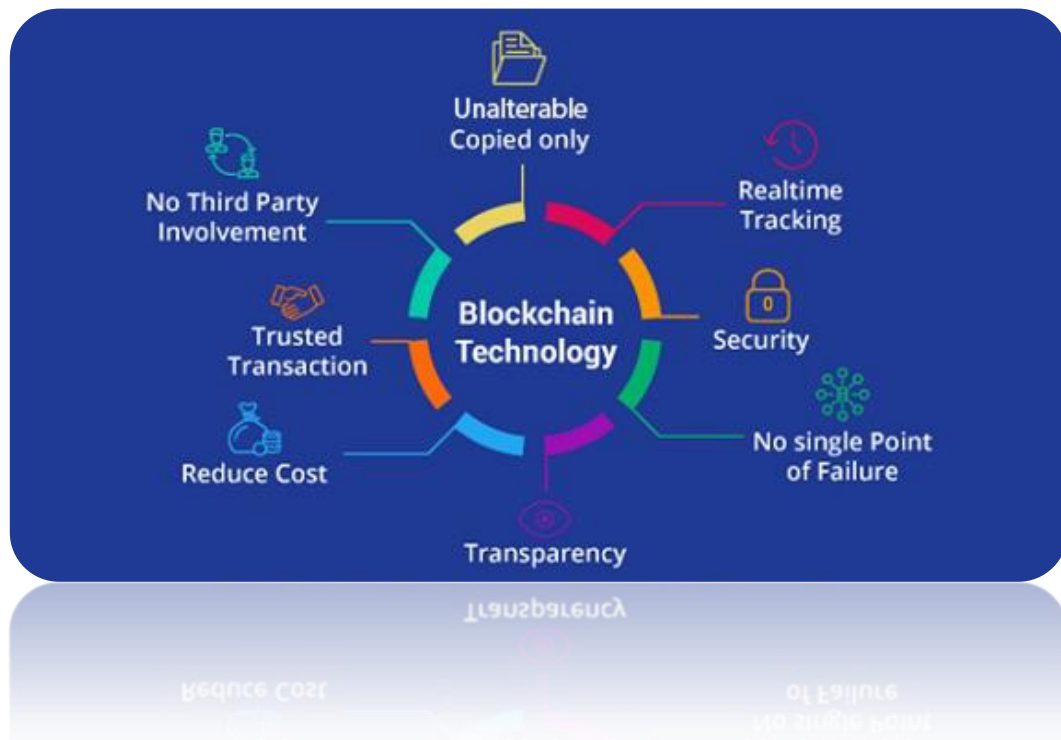
reduction to GHG, and sold to a buying entity which uses it to 'offset' instead of actually reducing their carbon footprint, is a double whammy on the climate.

- **Double Counting GHG Reductions:** This occurs when both sides, the Credit Holder/Project Developer selling the Carbon Offset Credit, as well as the Purchaser, show a reduction in their GHG emissions. The correct accounting procedure would be to not show a commensurate reduction in GHG emissions on the sell-side, once an offset is effected on the buy-side (to the best of our knowledge, the UNFCCC still hasn't been able to mandate this requirement. The Verdana Blockchain SaaS platform can't mandate it either, but it can do the accounting and keep tamperproof, immutable records.
- **Sale Of same Carbon Credit To Multiple Buyers:** This occurs when the same Carbon Offset Credit is traded /sold multiple times to several offset Purchasers.

2.2 Blockchain as a remedy: A Blockchain will resolve the Double Count issue and the Multiple Offset problem by allowing stakeholders to view the provenance of a carbon offset credit. This facilitates trade between parties who don't know each other. *However, the Blockchain in itself cannot address the Additionality issue.* For that, we connect IoT sensors on remote carbon footprints to our SaaS platform via the platform's APIs. The data thus collected and analysed without human intervention, then tells, amongst other things, whether the carbon reductions would have happened anyway, or are a direct result of the project set up to garner carbon offset credits. While the Verdana platform allows data enter through the web portal under its Standard GHG reporting feature, only data from IoT sensors and related reports & analytics are allowed through into the Blockchain, to ensure end-to-end immutability.

Blockchain Technology:

"The whole point of using a Blockchain is to let people — in particular, people who don't trust one another — share valuable data in a secure, tamperproof way." — MIT Technology Review.



3.1 Description of a Blockchain:

Blockchain technology is a decentralized, distributed & immutable ledger that records the provenance of a digital asset. By inherent design, the data on a Blockchain is unable to be modified, which makes it a legitimate disruptor of carbon markets.

3.2 Blockchain for Carbon Trading:

Firstly, Blockchain would eliminate double counting, and the multiple sales of the same Carbon Offset Credits, that plague carbon markets. Also, the Ethereum Blockchain protocol has Automated Market Makers (AMMs) allowing users to trade their digital tokens on the Blockchain without intermediaries. In theory, Blockchain provides the infrastructure required to create a digital Carbon Offset Credit ecosystem and engage all the stakeholders. In their paper “Is Blockchain Worth It? A Case Study of Carbon Trading,” Fangyuan Zhao and Wai Kin (Victor) Chan lay out the outline of a Carbon Offset Credit Blockchain. Clearly, a Blockchain does provide a traceable and auditable record of emission reduction projects. *They however need to be physically validated before being entered into the Blockchain.* Zhao and Chan propose a number of ways to verify including roping in universities, or using GPS and satellites. Whereas as mentioned earlier, Drs. Saraji & Borowczak suggest a global array of professionals. According to them, “Validators are an essential part of this ecosystem. They are accredited, globally distributed, technically competent consultants incentivised to parameterise appropriately and onboard projects to an open architecture marketplace that matches interested parties generating and retiring carbon credits”. *In real life and without automation to help out, all of this is even more complicated than it sounds.*

3.3 Expanding The Blockchain’s Scope: The Blockchain in the Saraji & Borowczak paper as well as that in the Zhao & Chan paper are self-contained. In contrast, the Verdana model co-opts carbon registries, carbon exchanges and a cloud-based SaaS platform — each of them connecting as nodes to the Blockchain.

3.4 Augmenting The Blockchain By Connecting to Carbon Registries: By doing so, a certifying registry can be ensured the data, reports and analytics it receives is clean and untampered. This is done by

having registries connect to the Blockchain as nodes, or over a Blockchain Bridge, and become *multi-sigs*. Alternatively, a registry can simply be provided a password to access the relevant smart contract in the Blockchain and access the pertinent data, reports, and analytics. Optionally, should the sell-side wish to digitise its carbon credit, the Blockchain can create a digital version of the *certified* carbon credit equivalent. The VCC is Verdana's digitized equivalent of a Carbon Offset Credit. Once a user opts to digitize her/his carbon offset credit, we need the relevant registry to certify the minting of that VCC.

3.5 Augmenting The Blockchain By Connecting To Carbon Exchanges: The Blockchain that Verdana uses is self-contained when it comes to buying & selling VCC tokens on the AMM. However, sale as with the registries, Verdana's Blockchain allows any digital exchange to connect to it as a node, thereby offering additional options to Verdana users.

3.6 Augmenting The Blockchain With A Cloud-Based SaaS Platform: A Blockchain will resolve the Double Count issue and the Multiple Offset problem. To address the matter of Additionality however, Blockchain smart contracts still by and large depend on human validation to physically validate Additionality claims. This is why we have a cloud-based SaaS platform attached as a node to the Blockchain. This allows validated data & analytics from remote carbon footprints to be fed into the Blockchain and be seen, assessed, and certified by stakeholders. *The SaaS platform continuously monitors, analyses, and validates remote carbon footprints, providing this information to various stakeholders, as well as to the connected Blockchain and in turn to the entities connected to, and using, the Carbon Blockchain. The emergence or output from the SaaS Platform enables all associated entities to see the same single truth at any given time.*

3.7 Ensuring An Immutable Chain From Source To Smart Contracts: Carbon footprint related data is fed into the SaaS Platform by IOT Sensors that connect from the carbon footprint via interfacing APIs. For wherever such intelligent, automated feeds are not possible, data may be keyed-in over the SaaS Platform portal. Such manually entered data can be processed in the SaaS platform, analytics done, and reports provided as soft copies. *However, manually entered data related analytics are not allowed into the Blockchain.* As such, the data provided via Blockchain is untampered from source, to the SaaS platform, and thence to a Smart Contract in the Blockchain.

Once validated by its designated consultants, a connected registry can then electronically certify the credit holder's request in a simple, straightforward manner without much of the current error & fraud prone manual processes coming into play. The registry may alternatively choose to leave certification to the Blockchain. Verdana's Blockchain requires a majority (70%) of connected certifiers (Designated Consultant, Registry) to certify the credit, for the Blockchain to then give a thumbs-up to the concerned registry, and optionally to mint a digital equivalent of the Carbon Offset Credit (i.e. the VCC).

Verdana's Blockchained SaaS Platform — Monitoring & Validating remote carbon footprints 24x7



4.1 Vision

The complexity associated with remote site validation of carbon footprints may be significantly reduced by connecting Verdana's currently operational, Blockchained SaaS Platform to carbon registries/certifying bodies like the UN's UNFCCC that governs the CDM Compliance Market, or to registries associated with the Voluntary Market such as GCC, GOLD, iREC, TIGR, VCS, etc. The Blockchained SaaS Platform multitasks to concurrently handle transactions with several such registries in accordance with standard carbon accounting principles adopted after Kyoto for the carbon offset credits & the carbon trade. The cloud-based SaaS system continuously receives, records, analyses, and assists in validating data from remote carbon footprints over the internet and it does so 24x7, 365 days a year. It then makes this data available to the Blockchain and to all connected stakeholders — Enterprise ESG Departments, Credit Holders/ Project Developers/VCC Holders, the Buyers, the Designated Consultants, the Registries, and the Carbon Exchanges.

4.2 Work Plan — General Workings Of The Blockchained SaaS Platform

The Verdana Platform is made up of three interconnected systems: The Cloud Based SaaS System, the Blockchain System, and the Verdana Single Truth (VST) System App — downloadable to a smart device.

The Cloud Based SaaS System enables authorised users to manage remote carbon footprints — access data, view analytics, and generate GHG reports for corporate & third party stakeholders. The Cloud Based SaaS System connects to registries (GOLD, iREC, TIGR, VCS, UNFCCC) and exchanges directly, as well as through the Blockchain System to which the SaaS system, carbon registries & carbon exchanges connect as nodes. The SaaS system can also enable the credit holders to list their carbon offset credits certified by standards on the platform marketplace as well as enable users to buy those from the marketplace to retire their carbon emissions without going through the attached Blockchain. However this entire transaction, if entirely over the SaaS system without going through the Blockchain, is conducted by the users using their own discretion as the platform just provides a marketplace.

To reiterate, the cloud-based SaaS system connects directly to certifying bodies & to carbon exchanges, allowing users to certify, and trade carbon offset credits. Credit Holders also have the option of connecting via the Blockchain to establish an immutable digital link from their carbon footprint to the registry, thereby enhancing the credibility and value of their Carbon Offset Claims. Optionally they can convert their certified Carbon Offset Credits to digital token equivalent (via the Blockchain). Verdana's Blockchain tokenizes the carbon offset credits into *VCC or White-labelled* Tokens to enable trade through digital coin exchanges. Offset credits once tokenised cannot be detokenized and have to be traded only through coin exchanges.

To be a part of this ecosystem via Verdana's *Blockchained SaaS Platform*, the Credit Holder/ Project Developer and the Buyer, needs to download and subscribe to the Verdana Single Truth (VST) App on a smart device (or subscribe on the Verdana website), and to register on a carbon registry as well as a carbon exchange that connects to Verdana's *Blockchained SaaS Platform* so they may get certified and trade in their carbon offset credits either over the paperless smart contract mechanism or the token equivalents being traded over the exchanges, both enabled by the Blockchain System. Verdana helps organise this for the buy & sell sides.

The feature set of the Blockchained SaaS Platform includes:

- Being native-cloud and native-blockchain.
- Its ability to handle a large variety of IoT sensors, and standardizing different proprietary protocols of a wide variety of IoT sensors, for calculations, analysis, as well as discovering, interpreting, and communicating significant patterns.
- The APIs.
- The flexibility, allowing for a variety of dMVR features to be quickly coded into the SaaS platform. The analytics can continually be changed to accommodate changes to standard and methodologies.
- Disallowing manually entered data from the Blockchain.
- Allowing a registry to retrieve immutable information on a carbon credit's provenance either through authorised (password enabled) access to the relevant smart contracts, or via a Blockchain Bridge.

4.3 Work Plan — Specific Workings Of The Cloud Based SaaS System

Carbon footprint related data is fed into the SaaS Platform by IOT Sensors that connect from the carbon footprint to the SaaS platform via interfacing APIs. Data from IoT sensors using proprietary protocols is standardized once allowed in, thereby enabling the platform to access data from a wide variety of IoT sensors. For wherever such intelligent, automated feeds are not possible, data may be keyed-in over the SaaS Platform portal. Such manually entered data can be processed in the SaaS

platform, analytics done, and reports provided as soft copies. *However, manually entered data related analytics are not allowed into the Blockchain.* As such, the data provided via Blockchain is untampered from source, to the SaaS platform, and thence to a Smart Contract in the Blockchain.

The SaaS platform being a node on the blockchain ensures that this information can be made available to entities connected to the Blockchain on demand, or as condition precedent. The emergence or output from the SaaS Platform enables all associated entities to see the same single truth at any given time.

4.4 Work Plan — Specific Workings Of The Blockchain System

Verdana's Blockchain System involves four Smart Contracts, interacting with the Cloud Based SaaS System, the Credit Holders/Project Developers/ VCC Holders, the Buyers, Compliance & Voluntary Registries, Designated Certified Consultants, and Carbon Exchanges. The relationships between the various sub-systems/Smart Contracts, and between them and external systems & entities is illustrated in Figure 2. The function of each Smart Contract and its emergence or output is listed below.

Smart Contract 1. A database on the Blockchain to record the essential information for the following stakeholders: (a) Certifiers. (b) Credit Holders/Project Developers/VCC Holders. (c) Buyers.

Smart Contract 2. A smart contract to mint digital VCC Tokens based on studied and approved Carbon Offset Credits through a series of functions:

- Approve offset credits entered by the Credit Holders/Project Developers/VCC Holders, which are certified by the Certifiers
- Provide the certified offset credits for sales on the marketplace on the SaaS platform
- Provide the certified offset credits for sales to a buyer on the blockchain
- Opt for Minting the VCC token with the offset credit as the underlying security
- Make the VCC token transferrable and burnable
- Burn the securitised offset credits which are used for the VCC tokens
- Mint non-fungible tokens as a badge of successful burning VCC tokens, representing offsetting carbon emissions.

Smart Contract 3. A smart contract with a multi-signature allows Certifiers to verify the minting and burn the carbon tokens. This contract will require approval by at least 70% of the Certifiers (associated with that particular type/brand of carbon credit) to be automatically executed. The Certifiers making up Smart Contract 3's multi-sig group would include the Registry and people they assign, the Registry's Designated Consultant, and in some cases, also the Offset Buyer and the Carbon Exchange.

Smart Contract 4: An automated market maker (AMM) smart contract that:

- allows automated trading of VCC tokens with digital money (e.g., stable coins or future central bank digital currencies),
- b) takes the certified Carbon Offset Credits after the validation round and post them on any exchange's inventory listing where they can be traded using regular banking channels. These tradable commodities can either be REC type credits posted onto Energy Trading Exchanges or equivalent VCC tokens listed on coin exchanges (b) charges a transaction fee on behalf of the carbon exchange,

- provides price discovery for the VCC tokens or Carbon Offset Credits in the associated carbon exchanges.

4.5 Feature Set For GHG Reporting & Carbon Trading:

Select your subscription

- GreenHouse Gas (GHG) Reporting - Standard i
- GreenHouse Gas (GHG) Reporting - Premium i
- Immutable, Tamperproof GHG Reporting i
- Validation and submission to Registry i
- Tokenisation of Certified Carbon Credits i
- Certified Carbon Credits on Carbon Exchanges i
- Tokenised Carbon Credits on Blockchain Exchanges i

Register

4.6 Service Fees & Charges

Users may subscribe to the Verdana service on the website or by downloading the VST App. The VST App may be downloaded for free. Users can buy the IoT sensor kit from Verdana, or other licensees, or third party vendors. Charges to connect the IoT sensors to the APIs are at cost and can be done by our partners in a particular geography or by the end user as part of the DIY (Do it Yourself) instructions.

The recurring fees for consuming the data and the ensuing data certification, audit and validation by the Verdana platform is fixed at \$8/ month per IoT sensor. Manual Data entry through the portal is free. A transaction fee is applicable for connecting over the Blockchain SaaS Platform to a carbon exchange, or registry, or to conduct a trade on the AMM built into the Blockchain. All trades through the Verdana Blockchain also incur an additional fee per trade charged by the relevant exchange in question. There is no such additional fee on trades conducted on the AMM.

Verdana’s transaction fees, and what an exchange may charge per trade, add up to significantly less than what you pay a middleman for the same service. Verdana has digitized the pain-points in the carbon trade through automation.

Figure 1: “A Blockchain-based Carbon Credit Ecosystem,” by Dr. Soheil Saraji & Dr. Mike Borowczak, with a global network of human validators as the weakest link:

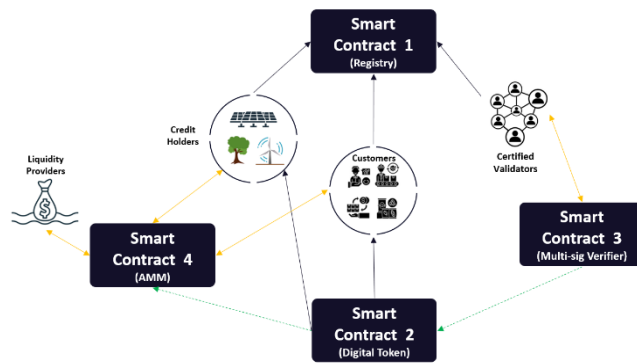
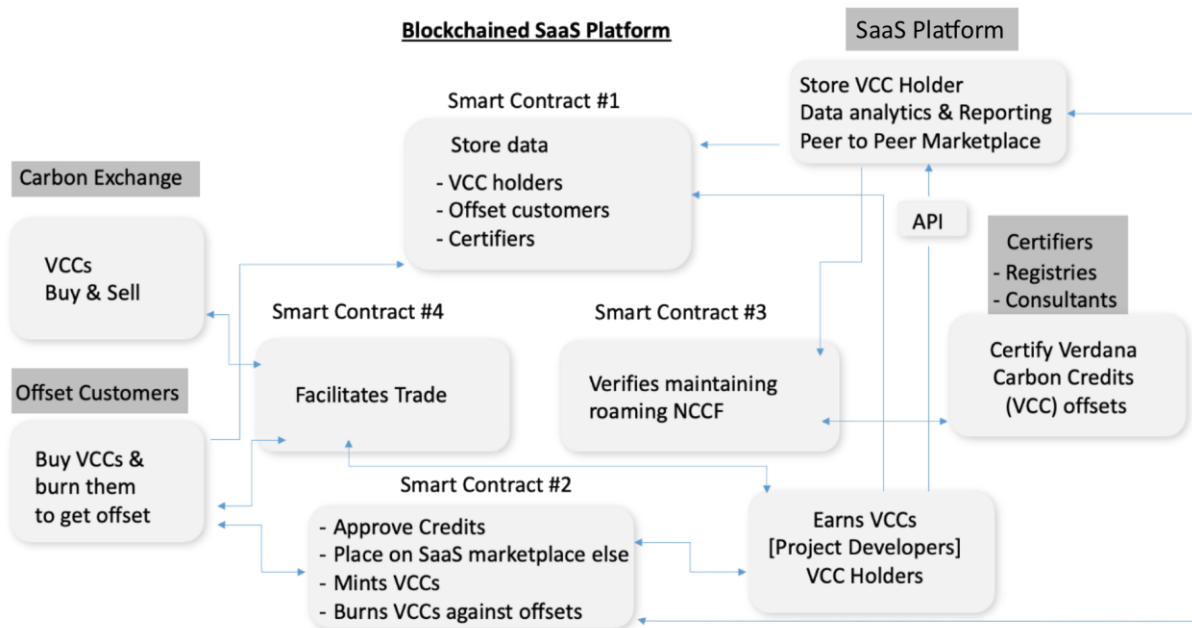


Figure 2. Verdana’s Blockchained SaaS Platform — reduces human intervention, increases credibility



Verdana Reference Sites:

The cloud-native Verdana platform is currently operational and being used :

- By BDx Data Centers Singapore Limited, to gather power and environmental related analytics from ten data centres across Asia. They use it under license across their data centre cluster under the white label: 360View — Operational.
- By BDx Data Centers Singapore Limited, to deliver immutable, tamperproof GHG reports to ESG auditors — Operational.
- By EXA, to gather power and environmental related analytics from 14 data centres across Europe — Being onboarded.
- By CarbonNation to provide an immutable digital chain connecting their various projects to registries to certify their carbon offset credits before sale to offset buyers

Online References Used In This White Paper:

- 1) John Oliver on the Carbon Trade: <https://apc01.safelinks.protection.outlook.com/?url=https%3A%2F%2Fyoutu.be%2F6p8zAbFKpW0&data=05%7C01%7Cbraham.singh%40bdxworld.com%7Ccedcb8dd79210422e017c08da8702986c%7Ce54d02ca662d401b9995ee65d91d85c7%7C0%7C0%7C637970742467628655%7CUnknown%7CTWFPbGZsb3d8eyJWIjoiMC4wLjA wMDAiLCJQIjoiV2luMzliLCJBTiI6IklhaWwiLCJXVCI6Mn0%3D%7C3000%7C%7C%7C&sdata=IL30vnFx5Stk%2Fk%2F41yQ%2B6EVVUXbj2ZHbZof6yoUHOJ0%3D&reserved=0>
- 2) "A Blockchain-based Carbon Credit Ecosystem," by Dr. Soheil Saraji & Dr. Mike Borowczak <https://arxiv.org/abs/2107.00185>
- 3) "Is Blockchain Worth It? A Case Study of Carbon Trading," Fangyuan Zhao and Wai Kin (Victor) Chan <https://www.mdpi.com/1996-1073/13/8/1980>
- 4) Carbon Trade — The Dawn Of A new Age Of Investing, by James Prosper <https://www.amazon.com/Carbon-Trade-Introduction-Sustainable-Millennial-ebook/dp/B09D32YTQB>
- 5) Understanding Automated Market Makers https://www.flovtec.com/post/what-is-amm-explaining-the-automated-market-maker-protocol?gclid=CjwKCAjwpKyYBhB7EiwAU2Hn2deVP6B9h-gdTkN7Ez0osWt0mQT1aEn9M4DuXhjuZFFyS57LQ9q9zRoCaRQQAvD_BwE

FAQs

1. What problems does the platform solve?

Carbon Footprint Management & Green House Gas Reporting: Enterprises are under increasing pressure to meet voluntary or compliance related caps to their carbon footprints. The Verdana Platform's cloud based SaaS system automates carbon management, enabling GHG monitoring & reporting without the typically large allocations of money and manpower manpower.

Facilitating Carbon Trade — eliminating errors, fraud, and middle men: The VST App enables carbon footprint data and analytics to be seen, assessed, validated, and certified by the stakeholders that make up the carbon trade which currently is beset with credibility issues:

- The Credit Holder/Project Developer/VCC Holder's credit related claims are accurately monitored, validated and policed by designated consultants/validators, without having to visit the remote sites.
- Once validated by its designated consultants, a connected registry can then go ahead certify a Carbon Offset Credit in a simple, straightforward manner without any of the currently complex processes coming into play. The registry may alternatively choose to leave certification to the Blockchain. Verdana's Blockchain requires a majority (70%) of connected certifiers (certified consultant, registry) to certify on Additionality, and optionally to mint a digital equivalent of the carbon credit (i.e. the VCC).

- The Blockchain's Automatic Market Maker (AMM) feature allows the Credit holder/ Project Developer/VCC Holder, and the Buyer to directly trade on an exchange without middlemen related costs, complexity, dependencies, and the not too infrequent gaming of the system.
- Once a Buyer purchases credits on the Verdana Platform, the Blockchain will burn the Carbon Offset Credits and issue a non fungible version. This completely eliminates any chance of the same Carbon Offset Credits being sold to multiple Buyers.

2. Is the project functional today? Being currently used or still an idea? If not yet built how are we sure it will deliver?

The project is currently operational and being used to gather power consumption, environmental (temperature, humidity) and carbon footprint related analytics from dispersed commercial facilities across Asia, and now Europe.

3. Is it scalable? Can it meet the needs of a really large user base?

The simple answer is, yes. The Blockchained SaaS Platform is a native cloud application and expandable in real time as workload increases. Being cloud based, it manages remote footprints across different geographies. The SaaS + Blockchain can simultaneously handle different brands of Carbon Offset Credits associated with different registries in both the Compliance market (UNFCCC) and the Voluntary Market (iREC, TIGR, VCS, Gold).

4. Is the platform secure? How is security guaranteed/ Is there "trust" involved in a centralized body? What kind of encryption are they using?

Trust is established by all stakeholders (the Credit Holder/Project Developer/VCC Holder, the Buyer, the designated consultant, the registry, and the exchange) being able to access the same information at the same time, anytime, 24x7, 365 days a year. A Blockchain is built on the premise of "Zero Trust", allowing people who don't know one another to share valuable data in a secure, tamperproof way. While the different parties to a trade may not know each other, Verdana's Blockchain provides each of them the same information and requires a majority (70%) of such connected certifiers (certified consultant, registry) to certify on Additionality for the Blockchain, and optionally to mint a digital equivalent of the carbon credit (i.e. the VCC).

5. Is the platform open and visible to everyone?

While the platform is built on open source modules, it is only visible to authorised parties. Once authorised, all entities can see the same single truth at the same time.

6. Is the code open source? If not, then why not? How will participants and investors be able to determine how decisions are made, transactions deemed valid, and exactly what is being executed when we use this platform?

It is open source.

7. Who is behind this project? Is the development team qualified and reputable? Have they been involved in previous projects that succeeded or failed? Why did they fail?

The Verdana Blockchained SaaS Platform was conceived and created after understanding how the Kyoto approved Emission Reduction Certificates (CER) scheme was being gamed globally. They digested all this and concluded the end-to-end solution to prevent gaming carbon credits, lay in a Blockchain attached to a SaaS based system connecting to remote carbon footprints. In their previous life the team had tremendous success building information management platforms as well

as automating laborious telco Meet-Me Room (MMR) processes. They may well be the first people to move such functionality to the cloud.

8. Are other projects doing something similar?

Carbon footprint management is expected to grow to a \$12B business by 2025. 68% of this is predicted to be SaaS based. However almost all of the SaaS based services require you to key in data to either calculate your carbon footprint or make GHG submissions. Project Developers currently using sensors, have all that data downloaded to spreadsheets. Verdana instead works through sensors connecting back to the SaaS platform via APIs. Very few sustainability consultants have systems that allow automated data delivery from carbon footprints to the cloud the way Verdana allows with it's cloud based Software-as-a-Service (SaaS) system connecting to IoT sensors deployed across the remote carbon footprint. Barely anyone has a SaaS system with an associated Blockchain that connects the carbon credit claimant to carbon registries, their designated consultants, carbon exchanges and to buyers. This end-to-end automation enabled by its *Blockchained SaaS Platform*, is the Verdana USP, enabling it to restore credibility to the carbon trade.
