CARBON CODEX

A Crowdsourced Carbon-Offset Decentralized EXchange for #NFTrees

A green paper by

Cascadia Carbon

Co·dex

/ˈkōˌdeks/

Noun

1. A manuscript or text in book form, as opposed to older methods of written communication (scrolls).

   - A "book of laws" or official list of medicines, chemicals, etc.

     biology: a tree trunk, see 'caudex'

Codex is derived from the Latin word "caudex" meaning tree trunk. Towards the end of the 1st century A.D., it was used as a term to indicate a new format used for documents kept not in the usual papyrus rolls but in "parchment codices" or books.

Akin to the scroll to codex innovation 2000+ years ago, Cascadia Carbon's CODEX is a new method to verify and store carbon offsets and eco-friendly actions in the form of a tokenized, commodity-backed stablecoin, built on our #NFTree protocol, and hosted by renewable-energy-powered servers.

TL;DR $CODEX is a revolutionary new way of storing and monetizing records of carbon negative assets and carbon neutral actions on a decentralized, digital, carbon-neutral, blockchain system.

This paper is premised on the following statements:

- Anthropogenic climate change is an _existential threat_ that we _will_ solve.
- Photosynthesis provides the _only way_ to store atmospheric carbon _at scale_
- Blockchain offers a new, public, transparent method to quantify, tokenize, fractionalize, value, verify and store **_carbon-negative "true" carbon offsets_** generated by trees, mariculture, agricultural land use, and technological [Direct Air Carbon Capture](#) (D.A.C.C.) methods.

∴ This paper proposes a mechanism for developing a decentralized, consensus-based crypto token based on carbon stored by photosynthetic organisms. Hereafter referred to as $CODEX, this token is a carbon-backed stablecoin protocol tied to biologically stored, or technologically captured and permanently mineralized carbon, providing a way to value and track stored carbon, a necessary development in our current economic system in the face of climate change.

It has become clear that our civilization can no longer afford to exclude carbon dioxide pollution as an externality if we want to maintain our current society, prosperity, and livelihoods. The fundamental omission of carbon emissions from our current neo-capitalist economic models has ignored the negative environmental impact of carbon dioxide's radiative forcing and the pollutant's multiplicative greenhouse effect. This has led to global warming, positive feedback loops, and is currently driving increasingly deadly heat waves, fires, droughts, monsoons, and other severe weather events, ice melt (and the associated increases in sea level

rise), and increased incidence and spread of deadly pandemics all of which threaten our health, homes, and our species very subsistence on the planet.

Climate change is nearly unanimously and unequivocally projected to intensify (https://climate.nasa.gov/) exponentially, as reinforcing positive feedback loops take hold of our earth systems, leading to melting of the permafrost, glaciers, and polar ice, reducing the planet's albedo, which then causes worsening heat waves, increasing frequency of severe weather events and coastal flooding as sea levels rise from the addition of melting ice to the oceans. Furthermore, increasing emissions from wildfires, refrigeration, and air conditioning use further exacerbates the problem, as we desperately try to cool ourselves in a rapidly and dangerously warming world.

Photosynthesis, primarily from trees, currently offers us the sole solution to this problem. The only proven way we currently have, at scale, to remove carbon from our atmosphere is via tree growth. While Direct Air Carbon Capture/Carbon Dioxide Removal (DAC(C)/CDR), seaweed mariculture, biochar, and greenstone (olivine) mineralization can be carbon negative when implemented carefully and correctly, none of these methods are as well understood or as scalable as forestry, which has had hundreds, if not thousands of years of formal study, full life cycle analysis, quantification, and use.

Absorbing approximately 25% of our total emissions each year (USFS), trees and forests are second only to ocean adsorption, driven by the chemical

process of ocean acidification (wherein carbon dioxide converts to dissolved carbonic acid), in carbon storage ability. Besides directly reducing the "urban heat island effect", as one of their innumerable co-benefits, they also produce oxygen, an essential element for all animal life on earth. Trees grow exponentially, as a function of their Leaf Area Index (LAI), which means they accelerate their carbon storage ability over time as they age; what as a seedling only pulls a couple of hundred grams per year of carbon out of the atmosphere, by the time it is a large 250+ year old tree, can have easily sequestered a dozen lifetime's worth of emissions. This feature makes them excellent for backing renewable investments; as living, growing organisms which remove a harmful pollutant (CO_2) and produce a necessary element (O_2), they are an excellent, stable, physical foundation for a digital store of value.

Similar to "gold-backed" currency of the past, $CODEX is a "carbon-backed" stablecoin, but different from gold-backed currency, more $CODEX tokens can be generated from #NFTree NFT's as they grow, adding to the ecosystem's growth over time. As trees grow, they gain size and accrue value exponentially faster over time, on a sigmoidal curve, making them an excellent backing for growing, long-term, "evergreen" investment returns.

An #NFTree is a digital twin, verified by a Non-Fungible Token (NFT) which will be generated and stored on our patent-pending (U.S. Serial No. 17/172,82) low-energy Carbon Offset Decentralized EXchange (CODEX). Each #NFTree is immutably tied to a physical, living, carbon-negative tree,

either already growing (and continuing to sequester carbon) or that will be planted and verified by Cascadia Carbon, one of our planting partners, and/or our global community of "*Carbonauts*". Carbon-negative $CODEX tokens are generated by these #NFTrees, providing cryptocurrency generation and participation capabilities to our engaged users (*Carbonauts*), and creating a commodity for ecologically-minded investors to trade on secondary markets, while adding data to climate models, reducing future climate risk, and eventually mitigating the detrimental effects of climate change as our society tracks (what we hope is quickly) towards net zero.

Using our #NFTree tokenization protocol, the Carbon Offset Decentralized EXchange (CODEX) will store the #NFTree digital twins' metadata using a 100% renewable energy-powered, low-energy database. By utilizing NVIDIA's AI-enabled GPU rendering technology, combined with "crowdsourced" user-gathered point cloud LiDaR mapping, and other open-sourced and crowdsourced data, including species type identification, and tree health metrics for urban, heritage, and old-growth trees, this database of digitally twinned trees allows for the creation of a layer-II, decentralized, blockchain-based, ERC-20 compatible, carbon-backed stablecoin based on this #NFTree data, backed by the carbon stored as the trees continue to grow. These digitally-quantified twins of living trees (#NFTrees) will eventually be able to accurately record the amount of carbon sequestered by an individual tree in its trunk, branches, foliage, and surrounding soil in real-time, and allow for our token to be backed with verified physical carbon pulled from the atmosphere. Our $CODEX token

is easily extensible to DACC, mariculture, and future lunar and Martian atmospheres as well.

This two token system (the #NFTree generator token protocol and the derived $CODEX stablecoin) allows for individuals to participate in the voluntary offset market supply, democratizing access to $CODEX tokens by allowing individuals to instantiate their own "generator tokens" (#NFTrees) by tying tree data to a transparent, decentralized, and democratic blockchain, generating profit from carbon-negative $CODEX carbon offset tokens spawned from their living #NFTree plants' growth.

[Blockchain](#) provides immutability, transparency, global reach, and the ability to tokenize and fractionalize carbon credits and offsets, making it excellent for use as a recording method for "true" carbon-negative carbon offsets. Based on an underlying store of data (#NFTrees), tokens have the capability to be "burnt" to reflect mortality events (if/when the underlying, linked #NFTree dies), creating an accurate registry of sequestered carbon and providing a dynamically updating database of photosynthetic organisms, and technological processes producing $CODEX carbon-backed tokens as they grow and evolve.

Our technology allows for the development and improvement over time of an accurate carbon storage coefficients and equations for individual urban heritage trees with our #NFTree token protocol data, and includes previously excluded individuals as "content creators" into the carbon offset creation process as "*Carbonauts*", offset creators who are rewarded for

their data collection work with fractional, 1kg-year $CODEX tokens. The collected #NFTree data ultimately improves climate modelling with on-the-ground, citizen science measurements, reducing future climatic uncertainty, and improving our society's response to, and chance of survival in, the climate emergency that has become our new reality.

#NFTree tokens, created on our CODEX blockchain (Carbon Offset Decentralized EXchange), allow for the transparent tracking, distribution, public auditing, and exchange of uploaded and planted trees. The value of the tree is equal to the carbon stored in it, plus the growth rate of the tree multiplied by a coefficient, primarily based on the tree's age and location minus an external risk factor coefficient, multiplied by a per ton price of carbon (initially set at $220/ton, but fluctuating over time). This new growth will be securely quantified and transparently tracked, spawning 1kg carbon dioxide equivalent (CO_2e) $CODEX tokens from the original digital-twin #NFTree. The CODEX blockchain will be based on a layer-II, IOTA-style "tangle" architecture, which will allow for low-energy, seamless, frictionless transfer and trade of $CODEX tokens, quickly and efficiently.

Non-Fungible Tokens (NFTs) provide a record of each tree and its characteristics (species, location, planting-partner, mature tree vs. planted seedling, ownership type, etc.) The original #NFTrees token can be modified and added over time, as they continue to grow and develop, while still retaining it's unique, immutable identifier and record of transfer and ownership. Spawned $CODEX tokens are immutable and fungible, existing only until the tree has died and decomposed, returning the carbon to our

atmosphere, when the tokens are "burned" using a smart contract, returning the associated carbon to the atmosphere.

Our #NFTree protocol is designed for immutable organic growth of a tree data structure from an initial point (origin seed) as more data is collected, verified, and added. Once enough quantified and verified data is added, and as each #NFTree token continues to grow with subsequent additions of data to its origin point, it will spawn fungible $CODEX tokens, representing additional units of stored carbon. As trees are modular, and therefore grow exponentially (according to a sigmoid curve), the rate of $CODEX tokens produced will steadily increase over time as the twinned tree grows, and with the worsening progression of climate change over time, the price of stored and offset carbon, and correspondingly the value of each #NFTree, will likely increase, providing positive returns and rewarding early environmental #NFTree creators and investors.

It is imperative to state that for each $CODEX token, at minimum, 1 kilogram of carbon will be immediately removed from the atmosphere for one year after taking into account a full Life Cycle Analysis (LCA) and will scale to a true 1 ton carbon equivalent token as our #NFTree protocol develops, making $CODEX a true carbon-negative cryptocurrency. $CODEX's design allows for protocol extensibility, which allows us to expand into artificial photosynthesis and other types of Direct Air Carbon Capture (D.A.C.) technology, and "true" carbon-negative agricultural offsets as they both come online. Carbon stored in old growth, and urban heritage trees will provide an initial liquidity pool of carbon, but may

become less essential over time as the function of the Carbon Offset Decentralized Exchange evolves, and [the definition of "additional" is refined](). As technological forms of carbon sequestration continue to be developed, refined, and are commercialized, and as the planet inexorably warms, (due to the positive feedback loops that make Venus a 600*C hellscape and Mars possible to be terraformed), the Carbon Offset Decentralized Exchange will likely prove to be a useful tool for engaging previously excluded and disincentivized individuals, young urban professionals, families, environmentalists, governments, and enterprises alike, engaging them in positive climate action.

CODEX functionality:

Users engage by either purchasing or creating #NFTrees or directly with the carbon offset exchange by converting ETH to $CODEX tokens via our ERC-20 smart contract.

#NFTrees protocol spawns $CODEX tokens from carbon sequestered and stored by ongoing organic growth of community and partner-verified #NFTrees.
$CODEX tokens are backed by verified, organically (biologically) sequestered cellulose, carbon dioxide, or other stable, atmospherically removed DACC carbon sources.

In summary, this paper proposes:

I. **#NFTrees:** A token protocol, allowing young urban environmentalists (and others disproportionately affected by climate change, including indigenous peoples and First Nations) to engage in the creation of Non-Fungible-Tokens (NFTs) which represent large, unique, or valuable urban specimen trees and planted seedlings, to upload to a carbon-neutral blockchain which stores records of these NFTs immutably. Eventually, quantification of carbon removal from the atmosphere of each #NFTree token will allow for the spawning of $CODEX tokens (see above) as each tree continues to grow and remove carbon dioxide from the atmosphere. This provides continuously growing, evergreen investment income (quite literally) to urban investors "*Carbonauts*" and rural carbon farmers.

II. **$CODEX Tokens:** A "smart contract", when executed, instantiates $CODEX tokens on a carbon-neutral exchange, called the Crowdsourced Carbon Offset Decentralized Exchange, shortened to CCODEX. Each token represents a biologically captured, or chemically mineralized, inert carbon offset sourced from independently verified, heritage trees initially, in select North American cities and regions, or from extant Direct Air Capture Carbon Dioxide Removal (DACC/CDR) technology. Plans to expand to other providers and processes of permanent DAC offset generation as these nascent technologies inevitably continue to develop, are refined, and become more efficient and widespread, are underway.

While this paper is by no means exhaustive, we believe it does propose a better way forward than the current method of externalizing and omitting carbon pollution and under-valuing the primary environmental benefits and secondary co-benefits of carbon-negative forests and trees.

Cascadia Carbon prides itself on our continuous improvement philosophy and we have built our company on the Cascadia Bioregional principles of Equity, Community Support, and Mutual Aid. If you have an idea on how to make our world more equitable, or would like to join us in our mission, please reach out at info@cascadiacarbon.com. We would love to have you join us.

Signed,

Carbonaut #1