CARBONLEDGER

A Non-Speculative Carbon Offset Token Protocol

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Issued by the CarbonLedger Trust

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Executive Summary

CarbonLedger is a non-speculative digital token protocol designed to create a permanent, transparent, and tamper-proof public ledger of global carbon emissions and their verified offsets. One token — the CLT (CarbonLedger Token) — is issued for every metric tonne of CO2-equivalent ever emitted by humanity since records began, based on data published by the United Nations Framework Convention on Climate Change (UNFCCC) and its recognised predecessors.

When an individual, organisation, or government wishes to offset their carbon footprint, they purchase a CLT — or a fraction of a CLT — and that token is permanently linked to a specific, verified offsetting activity. The token itself has no resale profit value by design: the economic model places all value in the act of transfer, via a transaction fee that flows entirely back to the CarbonLedger Trust to fund further offsetting activity.

The protocol is governed by a permanent international legal structure anchored in Liechtenstein — rated the world's number one philanthropy jurisdiction — with regional operational entities across the UK, Europe, the Middle East, Asia, and the Americas. Each regional entity is constitutionally subordinate to the Liechtenstein hub, which owns all offset assets in perpetuity and cannot be dissolved, sold, or redirected.

Key Properties at a Glance

Total supply: Fixed by reality — one token per tonne of CO2e emitted since records began (~2.5 trillion tokens)

New issuance: Annual UNFCCC data releases trigger minting of new tokens for that year's emissions

Price: Centrally set by the Trust — no market speculation, no exchange listing

Resale value: Zero net gain on resale — all proceeds flow to the Trust as a transaction fee

Offset link: Each activated token is permanently linked on-chain to a specific offset activity

Blockchain: Purpose-built Proof-of-Stake chain — no computational mining, near-zero energy use

Hub: Liechtenstein Stiftung — permanent, legally protected, owns all offset assets

Spokes: UK, EU, MENA, Asia, Americas — regional operational entities built over time

1. The Problem

1.1 Carbon Markets Are Broken

The voluntary carbon market, estimated at over $2 billion annually, is plagued by three structural failures: double-counting, fraud, and greenwashing. Offset credits are routinely sold to multiple buyers, projects are abandoned after the carbon has been counted, and there is no single global ledger that allows anyone to verify whether a given tonne of CO2 has genuinely been addressed.

Existing carbon registries — Gold Standard, Verra, the American Carbon Registry — are private, proprietary, and incompatible with one another. None of them are permanent. None of them are owned by the public.

1.2 Speculation Undermines Climate Outcomes

The emergence of tokenised carbon credits over 2021-2024 introduced a further problem: speculative trading. When carbon credits become financial instruments, their price reflects investor sentiment rather than climate impact. Credits sit in wallets as assets rather than being retired against real emissions. The people most motivated to hold them are the least motivated to use them.

1.3 Offset Projects Are Impermanent

Even legitimate offset projects face a fundamental impermanence problem. Reforestation land is sold. Companies go bankrupt. Contracts expire. A tree planted in 2005 to offset a tonne of carbon can be felled in 2030 when the landowner changes. There is currently no mechanism to permanently protect offset projects as a public good for all time.

2. The Solution: CarbonLedger

2.1 A Public Ledger of All Emissions

CarbonLedger establishes, for the first time, a single transparent public ledger accounting for every metric tonne of CO2-equivalent emitted by humanity. Supply is not determined by market demand, developer decisions, or algorithmic schedules. It is determined by physical reality: one token per tonne, issued when that tonne is counted.

The initial total supply is calculated from UNFCCC historical emissions data, supplemented by peer-reviewed scientific estimates for the pre-UNFCCC industrial period. This methodology is published openly, peer-reviewed, and updated annually as new UNFCCC data is released.

2.2 Tokens Activated by Verified Offsets

An unactivated CLT represents an unaddressed tonne of emissions. An activated CLT represents a tonne that has been verifiably offset through a specific project owned and operated by the CarbonLedger Trust. The on-chain record permanently links the token to that project, its GPS coordinates, its methodology, and its verification status.

A buyer who wishes to offset their carbon footprint purchases CLTs at the Trust-set price. The Trust then deploys the proceeds directly into offsetting activity — reforestation, peatland restoration, renewable energy in developing economies, or other IPCC-recognised methodologies — and activates the tokens against those projects.

2.3 Non-Speculative by Design

CarbonLedger eliminates the speculative incentive through three interlocking mechanisms:

- Supply vastly exceeds any plausible speculative demand — with approximately 2.5 trillion tokens representing historical emissions alone, there is no artificial scarcity to exploit.
- Price is set centrally by the Trust — there is no exchange, no order book, and no mechanism by which a secondary buyer can profit over the original purchase price.
- The transaction fee structure means that any resale at or above the Trust price results in zero net financial gain for the seller — all surplus flows back to the Trust.

2.4 Perpetual Ownership of Offset Assets

All offset projects funded through CarbonLedger proceeds are owned by the Liechtenstein hub in perpetuity. Third parties may contribute offset activity — farmers, landowners, project developers — and are paid a fair market rate for their work and for any land or rights transferred. Once transferred, however, those assets cannot be sold, mortgaged, or redirected. They belong to the planet, forever.

3. Token Design

3.1 Total Supply

Total CLT supply is pegged to cumulative global CO2-equivalent emissions as measured by the UNFCCC. As of 2026, this figure is approximately 2.5 trillion tonnes. New tokens are minted annually, corresponding to the prior year's global emissions as reported in the latest UNFCCC inventory. No tokens are minted for any other reason.

Element	Design Decision
Token name	CarbonLedger Token (CLT)
Supply basis	1 CLT per metric tonne CO2e emitted (UNFCCC data)
Initial supply	~2.5 trillion CLT (historical emissions to 2025)
Annual minting	Triggered by UNFCCC annual inventory release
Fractionability	Yes — purchasable to 6 decimal places
Issuing authority	CarbonLedger Stiftung (Liechtenstein hub) — sole minting authority
Burn mechanism	Tokens are not burned — retirement is recorded on-chain

3.2 Token States

Every CLT exists in one of two states: Unactivated (minted, held in the public ledger, available for purchase) or Activated (purchased and permanently linked on-chain to a specific verified offset project). Once activated, a CLT's record is immutable and publicly verifiable forever, without permission or fee.

3.3 Pricing and Transaction Fees

The Trust sets the CLT price in GBP (and equivalent currencies), reviewed no more than once per calendar quarter, reflecting the assessed cost of verified permanent carbon offsetting inclusive of overheads and a sustainability reserve.

Secondary market transfers are permitted. The CarbonLedger blockchain enforces a transaction fee equal to any amount by which the transfer price exceeds the current Trust issue price, automatically routed to the Trust. A seller who transfers a CLT at the current issue price receives exactly what they paid — the design removes the profit motive from secondary trading while preserving the right to transfer.

4. Governance and Legal Structure

4.1 The Hub-and-Spoke Architecture

CarbonLedger operates through an international hub-and-spoke structure, designed to combine maximum legal permanence with global operational reach. A single permanent hub entity in Liechtenstein owns all assets and holds governance authority. Multiple regional spoke entities — built progressively over time — serve as operational faces to the world in their respective markets, each constitutionally subordinate to the hub.

This architecture is modelled on the most durable philanthropic structures in existence. It ensures that no single government, legal change, or leadership failure in any one jurisdiction can compromise the mission, the assets, or the continuity of CarbonLedger.

The Patagonia Precedent

In 2022, Patagonia founder Yvon Chouinard transferred his $3 billion company to a two-entity perpetual structure:

— A Purpose Trust holding all voting (governance) rights, legally locked to the company mission forever.

— A Holdfast Collective holding all economic rights, channelling ~$100 million annually into environmental work.

CarbonLedger adopts the same principle of separating permanent governance from operational activity,
applied to a global charitable foundation rather than a commercial company.

4.2 The Hub: CarbonLedger Stiftung (Liechtenstein)

The permanent heart of CarbonLedger is a charitable Stiftung (foundation) established under Liechtenstein law — rated the world's number one philanthropy jurisdiction by the Global Philanthropy Environment Index in both 2022 and 2025. Liechtenstein foundation law, which dates to 1926, provides the most robust and internationally tested framework for permanent charitable purpose in existence.

The Liechtenstein Stiftung is a legally and economically independent special-purpose asset. It belongs to itself — there are no shareholders, owners, or beneficiaries who can extract value from it. Its sole purpose is the permanent reduction of atmospheric greenhouse gas concentrations through the acquisition, maintenance, and operation of carbon offset assets for the benefit of the global public.

What the Hub Owns and Controls

All CarbonLedger offset land, forests, and infrastructure assets worldwide
The sole token minting authority — no CLTs can be issued without hub authorisation
The CarbonLedger brand, protocol, and blockchain infrastructure
Governance rights over all spoke entities — including the right to appoint, remove, and dissolve them
All spoke assets revert to the hub on dissolution of any spoke entity
The framework agreements that define how each spoke must operate

The Stiftung requires a minimum founding capital of CHF/EUR/USD 30,000. At least one member of the foundation council must be a qualified professional resident in Liechtenstein, engaged through a licensed fiduciary firm. The foundation is subject to oversight by the Liechtenstein Foundation Supervisory Authority (STIVA) and is exempt from corporate income tax on its charitable activities.

4.3 The Founder Entity: CarbonLedger UK (CIO)

CarbonLedger's legal existence begins with a Charitable Incorporated Organisation (CIO) registered with the Charity Commission for England and Wales. The UK CIO is the cheapest and fastest entity to establish, requires no founding capital, and can begin operations — including fundraising, brand building, and technology development — within weeks of registration.

Critically, the UK CIO is designed from inception as a founder entity, not a permanent home. Its constitution contains an explicit intention clause stating that governance authority will transfer to the Liechtenstein Stiftung once established, and an asset transfer power enabling this transition without requiring a wind-up. During Phase 1, the UK CIO operates as the de facto headquarters of CarbonLedger while the permanent hub is being established.

Phase 1 Constraint — No Land Acquisition

During the UK CIO phase, CarbonLedger must not acquire land or permanent offset assets. All such assets must wait until the Liechtenstein hub is established, at which point the hub acquires them directly. This avoids the legal and tax complexity of transferring land from a UK charity to a Liechtenstein foundation at a later stage.
The UK CIO may fund offset project scoping, development costs, and partnerships, but ownership of physical assets must vest in the Liechtenstein Stiftung from the outset.

The UK CIO continues as a spoke entity after the hub is established, serving the UK fundraising and operational market in perpetuity.

4.4 The Spoke Network

Regional spoke entities are established progressively as CarbonLedger grows, each opening access to a specific market, donor base, or regulatory environment. Each spoke operates under a framework agreement with the Liechtenstein hub, which governs brand use, mission compliance, financial flows, and governance accountability.

Entity	Jurisdiction	Purpose	When
CarbonLedger UK	England & Wales (CIO)	UK fundraising; founder entity; Gift Aid donations	Phase 1 — immediate
CarbonLedger Stiftung	Liechtenstein	Permanent hub; owns all assets; sole minting authority	Phase 2 — Year 1
CarbonLedger Europe	Netherlands (Stichting/ANBI)	EU grants; European corporate partnerships; Euro donations	Phase 3 — Year 2
CarbonLedger Americas	USA (501(c)(3))	US philanthropic donations; corporate ESG budgets	Phase 4 — Year 3
CarbonLedger MENA	UAE — DIFC or ADGM	Gulf sovereign wealth; Middle East relationships	Phase 4 — Year 3
CarbonLedger Asia	Singapore	Southeast Asia; institutional investors; China gateway	Phase 5 — Year 4+
CarbonLedger China	China — registered NGO	Direct engagement with Chinese institutions and carbon market	Phase 6 — Year 5+

Each spoke entity is constitutionally required to pass surplus funds to the Liechtenstein hub for deployment into offset projects. Spokes may retain operating reserves as defined in their framework agreement, but may not accumulate assets independently or deviate from the CarbonLedger mission. All spoke trustees and directors are appointed with hub approval, and the hub retains the right to dissolve any spoke that fails to comply.

4.5 Trustee Structure

The Liechtenstein foundation council (equivalent to trustees) comprises a minimum of five members, of whom at least three must be independent. At least one must be a licensed Liechtenstein fiduciary professional. Trustees serve staggered five-year terms. The founding trustee may serve as Chair for a period not exceeding ten years. No single trustee may serve more than fifteen consecutive years.

4.6 Financial Accountability

All Trust accounts are published annually and filed with the Liechtenstein Foundation Supervisory Authority. An independent auditor reviews all accounts annually. Token issuance,

activation, and fee collection records are published as part of the annual report. The blockchain ledger itself constitutes a permanent public audit trail, accessible to anyone without permission or fee.

5. Technology

5.1 A Purpose-Built Blockchain

CarbonLedger operates on a dedicated, purpose-built blockchain. This decision is motivated by three considerations: operational independence (no dependency on third-party chains or their governance decisions), energy efficiency (the chain is designed solely for CLT issuance and transfer, with no general-purpose computational load), and alignment (using a carbon-heavy chain to operate a carbon offset protocol would be contradictory).

5.2 Proof of Stake Consensus

The CarbonLedger chain uses a Proof of Stake (PoS) consensus mechanism. Unlike Bitcoin's Proof of Work, PoS does not require validators to compete through energy-intensive computation. Validators are selected based on the quantity of CLT they have staked as collateral. The chain is estimated to consume less than 0.01% of the energy of an equivalent Proof of Work chain.

In the initial phase, the Trust operates the validator nodes directly. As the ecosystem matures, validation will be progressively opened to approved third parties who meet governance and technical requirements, subject to a Trust-controlled whitelist.

5.3 Issuance Model

Token minting is controlled exclusively by the Liechtenstein hub's issuer key. New tokens are minted in a single annual batch corresponding to the prior year's UNFCCC-reported emissions. The minting transaction is publicly visible on-chain and includes a reference to the specific UNFCCC data source and report date. No tokens can be minted outside this process.

5.4 Open Source Framework

The CarbonLedger chain is built on the Cosmos SDK, an open-source framework for building application-specific blockchains using Proof of Stake consensus, currently powering over 200 chains in production. CarbonLedger's chain code will be published as open source under a GPL-compatible licence, enabling independent security review and long-term community stewardship.

5.5 Public Ledger and API

All token issuance, activation, and transfer records are publicly accessible via a read-only API and browser-based explorer. For any given CLT, the explorer displays its current state, the date and price of purchase if activated, the offset project it is linked to, and the verification status of that project. No account or login is required.

6. Roadmap

CarbonLedger follows a phased development plan, beginning with the cheapest and simplest legal structure and building toward a permanent global organisation. Each phase builds on the last and is designed to be self-funding before the next phase begins.

Stage	Timeframe	Action
Phase 1	Months 1–3	Register UK CIO with future-transfer constitution. Appoint founding trustees. Begin operations, fundraising, brand, and technology development. Engage Cosmos SDK developer.
Phase 2	Months 6–12	Establish Liechtenstein Stiftung with minimum CHF 30,000 capital. Execute governance transfer — UK CIO becomes spoke. First offset project scoping (no land acquisition until hub exists).
Phase 3	Months 12–18	Mainnet blockchain launch. Public CLT purchase portal. First offset assets acquired by Liechtenstein hub. Establish Netherlands Stichting and apply for ANBI status.
Phase 4	Year 2	First annual UNFCCC-triggered minting event. Publication of first annual Trust report. Begin US 501(c)(3) registration. UAE entity scoping.
Phase 5	Year 3	US 501(c)(3) operational. UAE DIFC/ADGM entity established. Singapore entity scoping. Open third-party offset project registration.
Phase 6	Year 4+	Singapore entity operational. China registered NGO engagement. Pursuit of formal UNFCCC recognition. Full hub-and-spoke network operational.

7. Risks and Mitigations

Element	Design Decision
Regulatory risk	CLT has no intrinsic financial value and no exchange listing. Legal counsel in each jurisdiction confirms regulatory treatment prior to launch of each spoke entity.
Sequencing risk	UK CIO established before Liechtenstein hub. Mitigated by constitutional transfer clause and no-land-acquisition rule during Phase 1.
Governance failure	Minimum independent trustee majority in hub. Hub retains power to dissolve any spoke. Liechtenstein STIVA provides external oversight. Successor purpose named in founding documents.
Data integrity	Supply depends on UNFCCC data. Methodology published openly; any data dispute noted on-chain with source reference.
Technology failure	Open source Cosmos SDK code enables community review and forks. Independent security audit prior to mainnet launch.
Project permanence	Hub ownership of all offset assets legally protected. Liechtenstein law provides one of the strongest asset-ring-fencing frameworks in the world.
Spoke divergence	Framework agreements legally bind each spoke to hub mission. Hub retains appointment and dissolution rights over all spoke leadership.
Low adoption	Non-speculative design means protocol does not depend on speculative demand. Value created by genuine offsetting activity, not token price.

8. Conclusion

CarbonLedger is not a cryptocurrency in any conventional sense. It is a protocol for permanent, public, tamper-proof climate accountability — one that uses blockchain technology not to create financial value, but to create a record that cannot be destroyed, falsified, or forgotten.

Its legal architecture — a permanent Liechtenstein hub surrounded by a growing network of regional spokes — is designed to outlast any individual, any government, and any political cycle. Its token design is engineered to be useful rather than speculative. Its asset ownership model ensures that every tree planted, every peatland restored, and every tonne genuinely offset remains protected as a public good, in perpetuity.

Every tonne of carbon humanity has emitted since the Industrial Revolution deserves a permanent record. Every genuine act of offsetting deserves the same. CarbonLedger exists to create that record — and to ensure that the land, forests, and infrastructure that make those offsets real are protected, owned by no one, and available to all, forever.

For enquiries regarding this whitepaper, partnership proposals, or trustee nominations, please contact the CarbonLedger Trust founding team.

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