Preface

ECO Coin turns ecological health into income — automatically rewarding verified land stewards, funded by individual donations and companies buying Proof-of-Health Certificates.

This project does not rely on unproven technologies. We are not reinventing cryptography, satellite monitoring, or land registries. Our contribution is to combine widely adopted methods into a coherent, decentralised framework that assigns financial value to the preservation of healthy ecosystems. The novelty lies not in the tools themselves, but in their integration to solve the challenge of giving ecosystems a transparent, incorruptible financial representation.

The Value Gap

Modern society is built on ecosystems that quietly sustain all life and economic activity.

- Forests regulate climate
- Wetlands filter water
- Soils generate food
- Oceans store carbon

Yet in our financial systems, these services are treated as if they are worth nothing. An acre of intact rainforest that stabilizes weather across continents may be valued less than the timber it can be cut into.

This mismatch between true value and market value is at the heart of our ecological crisis. Human economies measure Gross Domestic Product (GDP), but GDP ignores the natural systems that make production possible in the first place. If global GDP depends on functioning ecosystems, then logically, ecosystems should command a measurable share of that GDP.

Instead, their value is invisible, externalised, and unaccounted for—until collapse makes the cost undeniable.

The challenge, then, is simple to state but hard to solve: **How do we give ecosystems financial weight equal to their real-world importance?**

We believe one answer lies in digital scarcity. Just as Bitcoin transformed abstract math into financial value through verifiable proof of work, we propose a system where verifiable proof of ecological health becomes the basis of new digital currency issuance. In this model, “mining” is not done with wasted electricity, but through the preservation and stewardship of ecologically valuable land.

To make this credible at global scale, the first requirement is verifiable truth about land and stewardship.

Problem 1: Verification

(Who really owns and stewards the land?)

The biggest challenge in rewarding ecosystem stewardship is proving three things:

1. The land exists
2. The land is healthy
3. The claimant is its true steward

For verification to work globally, it must be:

- **Decentralised** – no single authority controls approvals
- **Automated** – scalable without case-by-case reviews
- **Un-gameable** – fraud is unprofitable
- **Tamper-proof** – rules are transparent and enforced by code

Our solution: a layered framework.

- **Step 1: Automation** – Claims are cross-checked against government registries (where available) and satellite imagery to confirm land existence and ecological integrity. Most claims can be approved or rejected instantly.
- **Step 2: Human attestors** – If data is missing or anomalies appear, the claim goes to a pool of independent attestors. They review standardised evidence packets (parcel boundaries, satellite data, documents) and vote to approve or reject. Attestors stake tokens, so dishonesty costs them.

This two-layer system combines the speed of automation with decentralised human oversight — delivering global coverage without bottlenecks or single points of failure.

Government Records (where available)

Many countries maintain digital land registries that define legal ownership boundaries. Where available, these provide the strongest form of verification.

- A secure digital seal of the registry is anchored on the blockchain at regular intervals. If any parcel boundary changes, the seal breaks.
- When a steward applies, their parcel ID and boundary are checked against the sealed dataset, and their KYC identity is matched to the registered owner.
- If everything matches, the claim is instantly approved without human review.

This directly links land claims to authoritative records, making fraud or duplication nearly impossible.

Where registries don't exist or data is incomplete, claims fall back to satellite checks and attestors. Anchoring snapshots doesn't prevent tampering at the source, but it makes all changes transparent and historically auditable, since past versions remain immutable on-chain.

In practice, this provides the highest confidence wherever registries exist, while still allowing inclusivity through fallback verification.

Satellite Reality Checks (global)

Where registries are unavailable, satellites provide global verification. Public systems like **Sentinel (EU)** and **Landsat (NASA/USGS)** already scan the planet regularly. These long-established, open datasets are widely used by farmers, insurers, and conservation groups.

For verification, satellites confirm that:

- The parcel exists in the claimed location
- Its boundaries match the application polygon
- Its cover type (forest, grassland, cropland, wetland, urban) is consistent with the claim
- No obvious disturbances (fire, deforestation, major land-use change) contradict the claim

These checks are algorithmic, impartial, and publicly verifiable. If anomalies appear, the claim is suspended or escalated to human attestors for review.

This ensures that every parcel worldwide, whether in Europe or the Amazon, can be independently verified using impartial, open satellite data.

Open Attestor Market (fallback & edge cases)

Where no government registry exists, land claims are verified through an **open marketplace of attestors**. Participation is permissionless: anyone — individual, NGO, or analyst — can join by staking tokens.

Attestors do not inspect land in person. Instead, they review evidence packets to check whether claims align with **satellite data, documents, and community attestations**. Accountability comes from continuous satellite monitoring and public challenges, which means attestors can be penalised retroactively if fraud is later discovered.

How Attestation Works

- **Evidence packet**: Each claim includes parcel boundaries, satellite overlays, and supporting documents (title deeds, attestations, GPS perimeter walk).
- **Random assignment**: A panel of attestors is randomly drawn, with some local (knowledge of the area) and others global (impartiality).
- **Decision**: Attestors vote to approve or reject based on whether the parcel is:
    - *Real* – visible on satellite imagery
    - *Consistent* – not overlapping roads, towns, or false claims
    - *Backed* – supported by documents or attestations
- **Quorum**: If enough attestors approve, the parcel becomes active (but with lower VerificationWeight than registry-backed claims). Disputed cases can escalate to a larger appeal panel, funded by the protocol.

Incentives

- **Protocol-funded rewards**: Attestors are paid from a small share of new ECO issuance (max 5%). Complex cases may pay more.

- **Collateral staking**: Attestors (and sometimes stewards) lock tokens as collateral. More stake = higher chance of selection.
- **Slashing & redistribution**: Wrong decisions lose collateral. Some goes to challengers, but much is burned — benefiting all ECO holders.
- **Reputation**: Track records are public. Mistakes increase stake requirements and reduce selection chances. Retroactive slashing applies if fraud is later detected.

Why This Works

- Open to anyone — no central gatekeepers
- Standardised evidence — expertise not required, just alignment checks
- Dishonesty is unprofitable — accuracy is rewarded, fraud is punished
- Incentives are balanced — attestors cannot rubber-stamp or reject everything
  No entry cost for stewards — lowering barriers to adoption

Anti-Fraud Mechanisms

The protocol includes several safeguards to make fraud unprofitable:

- **Connectivity safeguard**: Rewards scale with parcel area, but splitting land into many small parcels does not increase issuance. HealthScore includes a connectivity bonus for large, continuous ecosystems, so fragmentation never pays.

- **Risk-weighted audits**: Each month, some parcels are re-verified using fresh satellite data or an attestor panel. High-value or high-risk parcels are audited more often, ensuring strong deterrence at manageable cost.

- **Open registry & APIs**: Every active parcel is published in a public ledger with open APIs. NGOs, journalists, and analysts can run independent monitors, making fraud easier to detect.

- **Challenge bounties (post-approval only)**: Once a claim has been approved by attestors, anyone may challenge it with counter-evidence. Challengers must post a bond, forfeited if the claim is valid. Successful challenges prove fraud (false ownership, fake boundaries, forged documents), leading to:

    - Steward loses tokens

    - Dishonest attestors are slashed

    - Challenger receives a bounty
      Natural ecological events (fire, pests, drought) suspend rewards automatically but do not trigger bounties.

- **Fraud funding rule**: Bounties are paid **only from slashed collateral** (stewards or attestors). No new tokens are minted, and no treasury funds are used. This prevents collusion: a steward and "friendly challenger" cannot profit together, since rewards always come from cheaters' own losses.

- **Reward cap**: Bounties are capped at a fixed share of slashed collateral (e.g., 30%). This prevents attackers from creating oversized fake claims to "farm" huge payouts. The rest of the slashed tokens are burned or redistributed to honest attestors, adding deflationary pressure.

Parcel Lifecycle

Every parcel moves through the same transparent lifecycle, enforced by smart contracts:

- **Pending** → Steward applies, claim under verification. If unresolved after a set time, the claim expires to avoid backlog.

- **Challenged** → Claim is in a public review window. Anyone can object by posting a bond (forfeited if the challenge fails). Active parcels can also return to this stage if new evidence emerges.

- **Active** → Claim is approved and begins generating ECO tokens based on its HealthScore. New parcels start in a provisional phase with reduced rewards until the first HealthScore update confirms stability.

- **Suspended** → An anomaly is detected (e.g., fire, deforestation, ownership change). Token issuance pauses until resolved. If the issue clears, rewards resume. If not, the parcel transitions to Revoked. Stewards can appeal suspensions with counter-evidence.

- **Revoked** → Fraud is proven or the land is permanently degraded. Rewards stop, and dishonest attestors may be penalised. Revoked parcels remain permanently visible in the public ledger. Stewards can reapply after restoration but under stricter review.

Why This Matters

- **Predictable**: Every parcel's status is always clear.

- **Rule-based**: Transitions are automatic, triggered by data (e.g., registry updates, satellite alerts, challenges).

- **Accountable**: Even active parcels are continuously monitored, and history is never erased.

This guarantees long-term transparency and ecological integrity.

Problem 2: Measurement

(Is the land actually ecologically healthy?)

Verifying ownership is only the first step. To make token issuance meaningful, the system must also measure the **ecological health** of each parcel.

This raises four key challenges:

- What counts as “health”?

- How can it be measured cheaply at global scale?

- How do we prevent gaming or superficial compliance?

- How often should scores be updated?

In short: **how do we calculate a parcel’s HealthScore?**

Measuring Ecological Health & Calculating HealthScore

Every parcel earns ECO tokens based on a **HealthScore** between 0 and 1. The score comes from free, existing satellite data, using methods already standard in conservation and agriculture.

Step 1: Data Collection

Public satellites scan the Earth every few days:

- **Sentinel-2 (EU)** and **Landsat (US)** → ground cover (forest, grassland, crops, water)
- **Sentinel-1 radar** → soil moisture and erosion, even through clouds
- **NASA FIRMS** and **Global Forest Watch** → fire and deforestation alerts

All datasets are open-access via APIs.

Step 2: Parcel Overlay

When a steward submits a parcel boundary, the system overlays it on satellite tiles and extracts only the data within that polygon.

Step 3: Indicators

The system calculates four core indicators:

1. **Biodiversity proxies (40%)**
    - Connectivity with surrounding habitats
    - Canopy heterogeneity (spectral diversity)
    - Seasonality (natural yearly cycles)
2. **Vegetation integrity (25%)**
    - Greenness/productivity (NDVI/EVI)
    - Canopy density and stability over time
3. **Water & soil stability (20%)**
    - Soil moisture, erosion, bare-soil index (Sentinel-1 radar)
    - Wetland extent and persistence
4. **Disturbance history (15%)**
    - Alerts of deforestation, fire, or fragmentation

Step 4: Weighting & Formula

Each indicator is normalised (0–1) and combined:

- `HealthScore = (0.40 × Biodiversity) + (0.25 × Vegetation) + (0.20 × WaterSoil) + (0.15 × Disturbance)`

Scores are smoothed over time to reduce noise from weather or cloud cover.

Step 5: Example

Suppose a parcel is assessed as follows:

- Biodiversity = 0.8
- Vegetation = 0.9
- WaterSoil = 0.7
- Disturbance = 0.6
- `HealthScore = (0.40 × 0.8) + (0.25 × 0.9) + (0.20 × 0.7) + (0.15 × 0.6)`
- `HealthScore = 0.32 + 0.225 + 0.14 + 0.09`
- `HealthScore = 0.775`

Result: HealthScore = **0.78 (rounded)**

Step 6: Transparency

All HealthScores are published on-chain with cryptographic proofs. Anyone can re-run the same calculations using open data, ensuring independent verification.

Why This Works

- **Global & free**: Data is already trusted by governments and insurers
- **No site visits needed**: Satellites cover everything
- **Monocultures can't cheat**: Diversity and seasonality checks expose them
- **Resilience rewarded**: All dimensions must align; canopy alone isn't enough
- **Fraud is obvious**: Clear-cutting drives scores toward zero
- **Scalable**: Millions of parcels can be scored consistently and cheaply

Preventing Gaming

Any system that ties money to ecological metrics risks manipulation. To stop this, anti-gaming rules are built directly into the HealthScore:

- **Diversity weighting**: Monocultures can't mimic biodiversity — spectral diversity, connectivity, and seasonal variation expose them.
- **Historical baselines**: Each parcel is scored against both global benchmarks and its own multi-year history. "Clear-cut + replant" spikes don't work; genuine restoration is rewarded.
- **Cross-checked signals**: Greenness (NDVI) alone can't drive a high score. Canopy, soil/water stability, disturbance history, and biodiversity must align.
- **Connectivity weighting**: Large, intact ecosystems get a modest bonus (via ConnectivityWeight and Area^α). Artificially splitting parcels offers no advantage.

Random Audits & Escalation

Continuous satellite monitoring is the baseline, reinforced by random checks:

- **Automated checks (~90%)**: Geo-tagged, time-stamped photos or videos cross-verified with parcel boundaries and satellite scenes.

- **Attestor review (~9%)**: Ambiguous cases go to decentralised reviewers. Honest work earns fees; dishonesty risks slashing.
- **Public challenges (~1%)**: Anyone can challenge with a bond. Proven fraud slashes collateral and pays a bounty.
- **Lifecycle link**: Audit outcomes move parcels automatically (Active → Suspended/Challenged → Revoked).

Update Frequency

- Monthly recalculation using rolling averages
- Noise filtering to remove weather/cloud artefacts
- Immediate suspension for severe anomalies (e.g., fire, deforestation)

Net Effect

- **Greenwashing fails**: NDVI alone isn't enough — other indicators must match.
- **Short-term tricks fail**: Multi-year baselines reveal manipulation.
- **Fraud is costly**: Random audits, attestors, and public challenges all create slashing risk.
- **Splitting doesn't help**: Connectivity weighting + Area^α make intact ecosystems more profitable.
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Problem 3: Rewards & Incentives

Definitions (used everywhere below)

- **HealthScore (HS):** The ecological integrity of a parcel of land from **0** (degraded) to **1** (pristine).
- **Healthy-Hectare Point (HHP):** 1 hectare of land with a Health Score (**HS**) of 1 produces **1 HHP**; 1 hectare with a HS of 0.5 produces **0.5 HHP**.
- **Global HHP:** sum of all parcels' **Area × HS** (before multipliers). Used to control how much of the annual ECO issuance is unlocked (adoption gating) and for splitting corporate cash to stewards.

What stewards earn:

Starter payments (bootstrap yield)

In the early years, ECO provides a **small, shrinking stream of tokens** to stewards as a kick-start and extra incentive for pioneers. **Only verified healthy land (Active HHP)** qualifies, and rewards are split **fairly** by ecological value (Raw Ecological Score). Issuance is **capped for life at 21,000,000 ECO**—the network will never mint more than this total—and the amount **tapers down each year** to preserve scarcity.

Why it exists: to support early adopters while the system grows. It is **not a permanent salary**; long-run income comes from **cash rails** (PoH certificates, donations, memberships in stablecoins).

Market purchases of Proof of Health Certificates

Corporations can purchase **Proof-of-Health (PoH)** Certificates: they represent **x** Healthy Hectares kept healthy for one year, issued as an on-chain certificate by the protocol. PoH certificates are a tangible, verifiable alternative to offsets: they measure real land health, are harder to game, and deliver co-benefits beyond carbon (water, biodiversity, resilience).

Unlike carbon offsets, PoHs don't claim to "erase emissions." Instead, they certify ongoing ecosystem health as a positive contribution.

Why corporations choose ECO over carbon credits

- **Credibility.** Certificates are backed by transparent, on-chain verification of land health, not by self-reported baselines.

- **Broader impact.** Rewards entire ecosystems, not just narrow carbon flows.

- **Reputation value.** Corporations can show clear, auditable support for nature, avoiding the greenwashing risks that have plagued traditional carbon markets.

How payments work

Corporations pay in fiat/stablecoins to the protocol. The protocol automatically splits each payment into two streams:

1. **Cash to stewards.** The majority of funds go directly to stewards in stablecoins, distributed pro-rata by their share of Global HHP.

2. **Buy-and-burn (phased in).** After an initial growth period (e.g., 5 years, or once corporate adoption passes a defined threshold), a fraction (**β**) of each payment is used to buy ECO on the open market and permanently burn it.

Burn design (scarcity + safety)

- **Dynamic fraction.** β is capped (e.g., 20–35%) and adjusts smoothly with adoption. Early on, 0% is burned (all funds go directly to stewards). As adoption matures, 20–35% is burned, strengthening ECO's scarcity and price linkage.

- **Rate cap (monthly burn budget).** In any month the protocol burns at most **0.5% of circulating supply**. Any excess funds that would push burns above this limit are redirected to stewards.

- **Stock cap (supply floor).** If circulating supply falls to or below **35% of the 21M lifetime cap**, the burn fraction β is automatically set to 0 until supply rises again.

- **Execution & safety.** Burns are executed gradually using TWAP/VWAP methods (market-average prices) to avoid distortion. β can only adjust by ≤ ±5 percentage points per month, based on public adoption metrics. All burn transactions are permanently visible on-chain.

Why this design matters

- **Early years:** stewards receive maximum cash support when adoption is still small.

- **Later years:** ECO supply becomes demand-coupled and deflationary, preserving long-term value.

- **Always safe:** capped burns and transparent execution prevent over-burning, protect stewards' income, and make the system predictable for markets.

Donations & Memberships

ECO also works like a **decentralised charity rail** — a transparent system that automatically splits donations between land stewards and conservation groups based on their verified ecological results (HHP scores). When you donate, your money is fairly shared across all active projects, supporting nature's recovery through one open, auditable network. Potentially uniting all environmental charities under one trustworthy banner.

To make giving more meaningful, every donor receives a **digital badge (NFT)** — a small piece of art that represents the ecosystem their donation supports. Each badge is randomly generated from a range of designs. Some are more unique than others, but none are sold or traded — they're simply collectible symbols of your impact.

As global HHP milestones are reached, **new designs** are unlocked, and existing badges can **evolve** — for example, showing more wildlife or healthier landscapes as real-world results improve. Artists whose work is featured are credited by name, so every NFT carries both creative and ecological meaning.

Donations start small — for example, a £5 or £10 contribution unlocks your first badge — turning each act of giving into a visible piece of nature's recovery story.

Perpetual Nature Endowment (smoothing)

A tiny skim (e.g., 3–5%) from PoH certificate purchases and memberships goes into a **safety pot** invested in low-risk, cash-like assets. We spend only the interest to soften thin months for stewards; the pot itself is left to compound over decades.

The endowment is **fully on-chain**, with balances and returns **publicly visible** at all times. Only the interest is ever withdrawn — the **principal is untouchable**, ensuring the fund grows steadily as a long-term backbone of steward income.

How Issuance is calculated

1) Lifetime Cap & Annual Taper

Hard cap. The network will never mint more than **21,000,000 ECO** in total.

Annual budget (geometric taper). Issuance follows a geometric decay schedule so that almost all ECO is distributed within the first ~20 years:

$$Budget(t) = B_0 \times r^{t-1}$$

where B0 = 21,000,000 × (1−r) and r is the decay rate (e.g. ~0.86). This ensures that ~95% of ECO is issued by year 20.

Dust floor. To avoid meaningless micro-payouts, issuance stops completely once the yearly budget falls below **10,000 ECO**. Any unissued remainder is left permanently unminted.

Scarcity guarantee. By design, the sum of all yearly budgets can never exceed the **21M lifetime cap**. No re-minting occurs later.

Why. This creates a strong bootstrap incentive for early stewards, while keeping ECO scarce and credible in the long run. Issuance is temporary support, not a permanent salary.

2) Adoption-Based Unlock

How it works.
Each year has a maximum ECO budget (from the taper above). Only a fraction of that budget is actually released, depending on how much healthy land is verified in the system (**Global HHP**).

- **Baseline unlock:** 10% of the yearly budget is always released, even at very low adoption.
- **Scaling with adoption:** The unlock fraction ramps smoothly from 10% to 100% as Global HHP grows.
- **Full unlock:** At the target of **40 million HHP**, the entire annual budget is released.

  Equation:

$$UnlockFraction = \min\left(1.0,\ 0.10 + 0.90 \times \frac{GlobalHHP}{40{,}000{,}000}\right)$$

So then to find the total unlocked ECO for the year:

$$UnlockedECO = Budget(t) \times UnlockFraction$$

3) Two-Bucket Split (after unlock)

How it works.
Once the yearly budget is unlocked (per Section 2), it is divided into two fixed buckets:

- **Steward Pot (90%).**
    - Ninety percent of the unlocked ECO is allocated to stewards.
    - To prevent windfalls when adoption is tiny, the Steward Pot scales up gradually until the system reaches **333,333 HHP**:

$$\text{StewardPot} = (\text{UnlockedECO} \times 0.90) \times \min\left(1, \frac{\text{GlobalHHP}}{333{,}333}\right)$$

If Global HHP = 10,000, only 10% of the Steward Pot is active. Once Global HHP ≥ 333,333, the full 90% is always active.

- **Secondary Pot (10%).**
    - The remaining 10% is reserved for protocol functions (e.g., verification and challenge fees, operational costs).
    - If unused, this portion stays **unminted** to preserve scarcity.

Why.
This design keeps the overwhelming majority of issuance flowing to stewards, while setting aside a small, capped share for system upkeep. The early ramp avoids a scenario where a few pioneer parcels capture disproportionate rewards before adoption reaches scale.

4) RawScore — the basis for rewards

Once the Steward Pot is defined, the next step is to measure how much each parcel *deserves* out of it. This is done with the **Raw Ecological Score (RawScore)** — a parcel's ecological "weight" inside the system.

Formula: RawScore = (Areaα × Health Score ×Regional Weight× Verification Weight × Connectivity Weight) + Improvement Bonus

Where:

- **Area^α:** larger intact parcels score slightly more than the same area broken into fragments (e.g., α = 1.05).
- **HealthScore:** ecological integrity, from 0 (degraded) to 1 (pristine).
- **RegionalWeight:** higher for globally critical ecosystems (e.g., Amazon rainforest).
- **VerificationWeight:** higher for stronger proof (e.g., registry-backed vs. attestor-only).
- **ConnectivityWeight:** small boost (up to 1.3) for parcels that form continuous landscapes.
- **ImprovementBonus:** extra points only if health improves over a 3–5 year baseline, preventing short-term gaming.

Global RawScore Total.
All parcels' RawScores are summed to produce the **Global RawScore Total**, which represents the system-wide ecological value for that period.

Note: RawScore is not ECO itself — it is the scoring system used to divide the Steward Pot fairly in the next step.

5) Conversion Rate — splitting the Steward Pot fairly

How it works.
The Steward Pot for each period is divided among all eligible parcels in exact proportion to their ecological value, measured by the **Raw Ecological Score (RawScore)**.

- If your parcel makes up **2% of the global RawScore**, you receive **2% of the Steward Pot**.
- If your parcel's RawScore doubles (because it's healthier, larger, or better connected), your ECO payout doubles.

Definitions.

- **Raw Ecological Score (RawScore):** A parcel's ecological value for this period, based on Area, HealthScore, and multipliers (Regional, Verification, Connectivity, ImprovementBonus).
- **Global RawScore Total:** The sum of all parcels' RawScores in the system during this period.

- **Steward Pot:** The amount of ECO set aside for stewards this period, after unlock and bucket split.

Equation:

$$ConversionRate\ (k_t) = \frac{StewardPot}{GlobalRawScoreTotal}$$

$$ECO\ Issuance_i = RawScore_i \times ConversionRate$$

In words.
Every steward receives ECO in direct proportion to their ecological contribution. If your land accounts for X% of the global RawScore, you receive X% of the Steward Pot. The system guarantees **no leakage** — 100% of the Steward Pot is distributed by this formula.

Worked Examples

Shape matters (10 ha connected vs fragmented)

Two stewards each control **10 hectares** at full health:

- **Steward A (Connected):** one connected **10-ha** block
- **Steward B (Fragmented): ten** separate **1-ha** plots

RawScore workings (with α=1.05 \alpha = 1.05α=1.05; Connectivity: connected = 1.2, fragmented = 1.0):

- Connected block:

$$10^{1.05} \times 1.2 \;=\; 11.22018454 \times 1.2 \;\approx\; \mathbf{13.4642}$$

- Ten separate plots:

$$10 \times 1^{1.05} \;=\; \mathbf{10.0000}$$

Result: same 10 ha, but the connected parcel scores **~34.6% higher**.

A) Early adoption — Global HHP = 10,000

- Unlock fraction:

$$0.10 + 0.90 \times \frac{10{,}000}{40{,}000{,}000} \;=\; 0.100225 \;\; (= 10.0225\%)$$

- Unlocked ECO (Year-1 budget $B_1 = 2{,}919{,}000$)
  $2{,}919{,}000 \times 0.100225 \approx \mathbf{292{,}556.78}$
- Early ramp (to prevent windfalls):
  $\min(1,\ 10{,}000/333{,}333) \approx \mathbf{0.03}$
- Steward Pot:
  $292{,}556.78 \times 90\% \times 0.03 \approx \mathbf{7{,}899.04\ ECO}$
- Conversion k_t (≈ ECO per RawScore):
  $\mathbf{0.789904}$

Issuance

- Connected (13.4642 RS): **10.635 ECO**
- Fragmented (10.0000 RS): **7.899 ECO**

B) Growing adoption — Global HHP = 2,000,000

- Unlock fraction:
  $0.10 + 0.90 \times \frac{2{,}000{,}000}{40{,}000{,}000} = \mathbf{0.145}$ (14.5%)
- Unlocked ECO:
  $2{,}919{,}000 \times 0.145 \approx \mathbf{423{,}255.00}$
- Ramp: capped at 1 (since $2{,}000{,}000 > 333{,}333$)
- Steward Pot:
  $423{,}255.00 \times 90\% \approx \mathbf{380{,}929.50}$
- Conversion k_t:
  $380{,}929.50 / 2{,}000{,}000 \approx \mathbf{0.1904648}$

Issuance

- Connected: **2.564 ECO**
- Fragmented: **1.905 ECO**

C) Full target adoption — Global HHP = 40,000,000 (full unlock)

- Unlock fraction: 1.00 (100%)
- Unlocked ECO: 2,919,000.00
- Steward Pot: 2,627,100.00
- Conversion k_t:
  $2{,}627{,}100 / 40{,}000{,}000 = \mathbf{0.0656775}$

Issuance

- Connected: **0.8843 ECO**
- Fragmented: **0.6568 ECO**

At scale, ECO issuance per hectare becomes very small. Long-term steward income comes mainly from **corporate payments** (PoH certificates) and **donations**, not issuance.