



WP10 – Tokenomics & Economic Sustainability

Series	sOS Execution
Status	Revised Draft – Branch A + Branch B (Anthropic Opus 4.8) revisions applied
Date	2026-06-28
Priority	High – Phase 2
Review Mode	Full Redundant Review (Branch A: Pi/DeepSeek → Branch B: Anthropic Opus 4.8 → Synthesis → Revision)
Grounded in	WP8 (Technical Architecture §3.6), WP9 (Legal & Compliance §4, §10, §11.4), Execution Budget (AD-39–43), SBT literature (Weyl/Buterin/Ohlhaber 2022), SourceCred, Optimism RPF, Colony
Differentiated decay rates	address the core tension: a researcher producing one landmark paper every 3 years must not be decayed for "inactivity" between outputs. Research contributions earn slow-decay credit; governance participation earns standard-decay credit. Activity is measured per dimension – inactivity in governance does not decay research credit, and vice versa.
Fiat reserve requirement	The treasury must maintain a fiat reserve floor of **9 months of projected operating costs** at all times. At Phase 2 burn rate (~€550K/year), this means a minimum fiat reserve of ~€410K. If the reserve falls below 6 months, the DAO triggers mandatory cost reduction. If below 3 months, operations enter emergency preservation mode (salaries only, no new commitments). This reserve is held in EUR in the association's bank account, not in crypto. Grant applications must target maintaining the reserve floor, not just covering current burn.

Abstract

This working paper defines the token economic model for the sOS DAO: token functions, distribution mechanics, vesting schedules, treasury management, incentive alignment, and economic sustainability. The sOS token is a non-transferable governance and utility token within a non-profit scientific research program. It is not a speculative asset, not publicly offered, and not designed for secondary market trading. This paper specifies how the token enables DAO

governance, rewards scientific contribution, aligns incentives across stakeholders, and funds the long-term operation of sOS infrastructure. The economic model prioritizes sustainability over growth, contribution over purchase, and scientific integrity over financial returns.

1. Introduction: Tokenomics for Science, Not Speculation

Most token economic models are designed for financial speculation: create scarcity, drive demand, pump price, enrich early holders. sOS rejects this model entirely. The sOS token exists for three purposes and three purposes only:

1. **Governance:** To enable distributed decision-making about research direction, resource allocation, and protocol evolution.
2. **Incentive:** To reward scientific contribution, governance participation, and community building.
3. **Access:** To gate participation in DAO governance and sandbox experiments.

The token does not represent equity, profit-sharing, or investment. It is a **membership and governance instrument** within a non-profit scientific association, governed by the legal framework specified in WP9.

The sOS token economy is built on **Proof of You** (thesis §14.4, §17.4): validation and consensus through data and people's decisions. Tokens are earned through **human-validated contribution**, not purchased. The machine domain computes label matches and S^2 variance; the human domain validates. This hybrid validation – the concatenation of human scores and machine metrics – is what gives tokens their legitimacy.

1.2 Design Principles

Non-transferable	Prevents speculation, regulatory capture, plutocracy	Token bound to UILL identity; transfers require DAO governance vote
Contribution-based	Rewards what sOS values: research, governance, community	Token distribution tied to verifiable contribution metrics
Decaying	Prevents power entrenchment	Token balances decay if unaccompanied by continued contribution
Non-purchasable	Governance cannot be bought	No public sale, no IDO, no exchange listing
Sustainable	Infrastructure must fund itself	Treasury allocation from grants, donations, and service revenue

2. Token Functions

2.1 Governance Weight

The token provides voting weight in DAO decisions. Different decision classes (WP8 §5.6) use different weighting mechanisms:

C0 (Self-coordinating)	None	Pure stigmergy
C1 (Lightweight)	Reputation-weighted signal	Token optional
C2 (Governed allocation)	Token + reputation-weighted voting	Active membership required
C3 (Constitutional)	Token + reputation + extended deliberation	Supermajority; guardian review

2.2 Membership Gate

Holding a minimum token balance (initially: 1 token) is required for DAO voting rights. This is a Sybil-deterrent, not a wealth gate – tokens are earned, not bought. The minimum is deliberately low to prevent exclusion.

2.3 Incentive Distribution

Tokens are distributed as governance weight for verified contributions. **Important:** tokens confer governance weight only – they are not financial compensation. Actual economic incentives (salaries, honoraria, stipends) are paid in fiat through the association's grant-funded

treasury. This separation resolves the labour-law contradiction identified in WP9 §11.4: token rewards are legally valueless governance instruments, not compensation. Contributors are compensated in EUR through compliant employment or service agreements.

Research	Working paper authorship, peer review, sandbox data contribution	DAO proposal + reputation-weighted vote	Slow decay (4-year half-life) – research output is infrequent but high-value
Governance	Voting participation, proposal quality, review thoroughness	Automated distribution based on participation metrics	Standard decay (2-year half-life) – governance is ongoing
Community	Mentorship, public engagement, event organization, translation	DAO proposal + community nomination	Standard decay (2-year half-life)
Infrastructure	Code contribution, security audit, node operation	DAO proposal + technical review	Slow decay (4-year half-life) – infrastructure has long-term value

Differentiated decay rates address the core tension: a researcher producing one landmark paper every 3 years must not be decayed for "inactivity" between outputs. Research contributions earn slow-decay credit; governance participation earns standard-decay credit. Activity is measured per dimension – inactivity in governance does not decay research credit, and vice versa.

2.4 What the Token Is NOT

- ❌ Not a currency – cannot be used for payment outside sOS.
- ❌ Not an investment – no expectation of profit.
- ❌ Not transferable – cannot be sold, gifted, or inherited without DAO approval.
- ❌ Not a stablecoin – no value peg.
- ❌ Not a speculative asset – no public sale, no exchange listing.

3. Token Distribution Model

3.1 Allocation Pools

Total token supply is not fixed at genesis. It is **elastic and contribution-linked**: tokens are minted when contributions are verified, within annual inflation caps set by DAO governance.

Research & Contribution	~50% of annual mint	Immediate + 6-month cliff for large grants	Reward scientific contribution
Governance Participation	~20%	Immediate, small amounts	Incentivize voting and proposal activity
Team & Operations	~15%	4-year vesting, 1-year cliff	Compensate core contributors
Community & Ecosystem	~10%	DAO-governed	Grants, events, ambassadors
Treasury Reserve	~5%	DAO-governed	Emergency, strategic initiatives

Allocations are annual caps, not fixed budgets. If fewer contributions occur, fewer tokens are minted. The DAO votes annually on pool allocation percentages.

3.2 Vesting and Cliffs

- **Core team tokens:** 4-year linear vesting with 1-year cliff. This prevents early exit while ensuring long-term alignment.
- **Research grants:** Immediate distribution for small contributions (<1% of annual cap); 6-month cliff for large grants (>1%).
- **Governance rewards:** Immediate, small amounts per action – designed to be too small to accumulate meaningful power without sustained participation.
- **Community grants:** DAO-governed, typically 6–12 month vesting with milestone-based release.

3.3 Anti-Concentration Mechanisms

Annual inflation cap (5% of circulating supply)	Prevents uncontrolled dilution and power shifts
Individual accumulation cap (max 5% of total supply per identity)	Prevents any single participant from dominating governance
Decay on inactivity (2-year half-life without contribution)	Ensures governance power reflects current engagement, not historical accumulation
Non-transferability	Prevents whale accumulation through purchase
Reputation-weighted voting (WP8 §3.4)	Dilutes pure token-weighted power with earned reputation

3.4 Token Decay Model

Tokens decay when the holder shows no verifiable contribution in a given dimension:

- **Research credit decay:** 4-year half-life. No contribution within 24 months triggers decay at 50% per subsequent 24 months. A researcher producing one paper every 3 years retains substantial governance weight.
- **Governance credit decay:** 2-year half-life. No participation within 12 months triggers decay at 50% per subsequent 12 months. Governance requires ongoing engagement.
- **Community/Infrastructure credit:** 2-year and 4-year half-lives respectively, matching their contribution cadences.
- **Decay destination:** Tokens are burned (removed from supply). Under elastic supply, burning is primarily a bookkeeping mechanism rather than a scarcity driver – it ensures that governance weight, not just percentages, reflects active contribution.
- **Reactivation:** Any verified contribution in a dimension resets that dimension's inactivity clock.
- **Minimum balance:** A minimum of 1 token is preserved indefinitely to maintain membership. Governance weight decays but membership remains.
- **Metric-gaming defense:** Automated per-unit rewards (translation per word, data per dataset) are deliberately small and subject to DAO-governed rate limits. Large rewards require DAO vote + reputation-weighted review. Per WP10's engagement with SourceCred's failure analysis: metric-gaming destroyed SourceCred's credibility within 18 months; sOS learns from this by making high-value rewards DAO-governed, not automated.

4. Treasury and Financial Sustainability

4.1 Treasury Composition

The sOS treasury holds:

Fiat (EUR)	Operational expenses: salaries, rent, services	Association bank account; multi-signature authorization
Crypto (ETH / stablecoins)	Smart contract gas, DLT infrastructure, token operations	Multi-signature wallet; DAO-governed
sOS tokens (unminted cap)	Future contribution rewards	Governance-controlled minting

4.2 Revenue Sources

sOS is a non-profit. It does not generate profit for token holders. It generates revenue to fund operations:

Research grants (Horizon Europe, ERC, national)	Primary	Primary	WP9 §4.4 EU funding landscape
Institutional donations	Secondary	Secondary	Foundations, philanthropic orgs
Service revenue (sandbox data, consulting)	None	Tertiary	Only if aligned with mission; DAO-governed
Membership fees	None	Possible (sliding scale)	If introduced, must not exclude
Token sale	None	None, ever	Against design principles

4.3 Cost Structure

Annual operating costs, from the execution budget (AD-39–43):

Team (4 FTE core)	€120K	€180K	€240K
Infrastructure (DLT, storage, AI)	€10K	€40K	€80K
Legal & Compliance	€15K	€30K	€50K
Sandbox operations	€0	€50K	€100K
Diffusion & Events	€5K	€30K	€80K
Total annual	~€150K	~€330K	~€550K

Phase 0–1 funding target: €450K–€600K from grants and donations. Phase 2+ funding target: €500K–€700K/year, with institutional grants as primary source.

Fiat reserve requirement: The treasury must maintain a fiat reserve floor of **9 months of projected operating costs** at all times. At Phase 2 burn rate (~€550K/year), this means a minimum fiat reserve of ~€410K. If the reserve falls below 6 months, the DAO triggers mandatory cost reduction. If below 3 months, operations enter emergency preservation mode (salaries only, no new commitments). This reserve is held in EUR in the association's bank account, not in crypto. Grant applications must target maintaining the reserve floor, not just covering current burn.

4.4 Sustainability Model

The token is not the funding mechanism – it is the governance and incentive mechanism. Funding comes from grants and donations. The token ensures that those who contribute to sOS govern sOS.

This avoids the fundamental tension in token-funded DAOs: the need to increase token value to fund operations creates pressure for speculation, which undermines governance integrity. By separating funding (fiat grants) from governance (non-transferable token), sOS maintains both financial sustainability and governance integrity.

5. Incentive Design

5.1 What sOS Rewards

Publishing a working paper	Medium (DAO vote)	Core research output
Peer reviewing a paper	Small (automated)	Essential for scientific quality
Participating in DAO votes	Very small (automated)	Governance quorum
Proposing a successful initiative	Medium (DAO vote)	Initiative and leadership
Contributing sandbox data	Small (automated per dataset)	Research infrastructure
Finding and reporting a security vulnerability	Medium–Large (DAO vote)	Security is collective good
Mentoring new members	Small (community nomination)	Community growth
Translating content	Small (automated per word)	Trilingual accessibility

5.2 What sOS Does NOT Reward

- ❌ Holding tokens (no staking yield)
- ❌ Providing liquidity (no AMM, no liquidity pools)
- ❌ Early participation without continued contribution (decay)
- ❌ Purchasing tokens (not possible)
- ❌ Marketing/hype generation (not a contribution metric)

5.3 Sybil and Gaming Resistance

Creating fake identities to farm governance rewards	Rewards are too small to justify the effort; reputation requirement for meaningful rewards
Collusion ring to approve each other's proposals	Randomized anonymous review; statistical anomaly detection; reputation cost of overturned decisions
Proposing low-quality work to extract tokens	Reputation-weighted voting filters; continued low-quality proposals reduce proposer's reputation
Early accumulation + inactivity	Token decay; no staking yield

6. Token Lifecycle

6.1 Genesis

Phase 0 (2026): No token exists. The association operates without a DAO.

6.2 Testnet Phase

Phase 1 (2027): Testnet token deployed on sandbox DLT. Distributed to sandbox participants for governance experimentation. No economic value. No mainnet deployment.

6.3 Mainnet Genesis

Phase 2 (2028, subject to WP9 gating risks R1/R2 resolution): Mainnet token deployed. Initial distribution:

- Founding team: 15% of genesis supply (4-year vesting, 1-year cliff)
- Early contributors (WP0–WP9 authors, sandbox participants): 10% (6-month cliff)
- Research & Contribution pool: 50% (minted over time as contributions occur)
- Governance & Community pool: 20% (minted over time)
- Treasury reserve: 5% (DAO-governed)

Note on self-allocation: The authors of WP0–WP10 and the founding team are allocating themselves 25% of genesis governance weight. This is a structural conflict of interest. Mitigation: (a) Genesis allocation must be ratified by an independent governance council (3+ external academics not receiving allocation) before deployment, (b) the 4-year vesting ensures founders must continue contributing to retain power, (c) decay applies equally to all allocations, (d) the

inflation mechanism dilutes genesis allocations over time as new contributors earn tokens. This is the centralized bootstrap problem acknowledged in WP8 §2.5 – the path to distributed governance is explicit, time-bounded, and auditable.

Annual inflation cap: 5% of circulating supply. DAO votes annually on the cap.

6.4 Steady State

By Phase 3 (2030+), the token economy should reach steady state where:

- Annual token distribution approximately equals annual decay.
- Governance power reflects current contribution, not historical accumulation.
- Treasury is funded by institutional grants, not token minting.
- Token holders are active researchers, governance participants, and community members.

7. Relationship to MiCA and Regulatory Compliance

Per WP9 §4, the sOS token is structured to minimize regulatory exposure:

ART (stablecoin)	✗ Not applicable	No value peg
EMT (e-money token)	✗ Not applicable	Not referencing fiat currency
Utility token (Title II)	⚠ Potentially, but:	–
– Offered to public?	No	Distributed only to verified association members
– Admitted to trading?	No	Non-transferable
– White paper required?	Not if not publicly offered	WP9 recommends CNMV sandbox engagement regardless

The non-transferable, non-publicly-offered design keeps the token outside MiCA's core scope. If future governance decides to introduce transferability or external distribution, a full MiCA compliance review must precede it.

9. Prior Art and Lessons Learned

sOS tokenomics engages directly with prior work, including its failures.

9.1 Soulbound Tokens (SBTs)

Weyl, Buterin, and Ohlhaber (2022) proposed non-transferable, identity-bound tokens as the foundation for decentralized society. The sOS token is an SBT implementation specialized for scientific governance. Key differences: (a) sOS adds dimension-specific decay rates, which SBTs did not specify, (b) sOS separates governance weight (token) from economic value (fiat compensation), resolving the SBT ambiguity about whether non-transferable tokens should have financial value.

9.2 SourceCred (and Why It Failed)

SourceCred was the most ambitious contribution-weighted governance experiment in the DAO space. It awarded "cred" (reputation/governance weight) based on contributions tracked through platforms like GitHub, Discourse, and Discord. **It failed within 18–24 months.** The failure modes are directly relevant to sOS:

Metric-gaming ("cred farming") – participants optimized for the automated metrics, not real value	Automated rewards are deliberately small; high-value rewards require DAO vote + reputation-weighted review
Algorithmic governance of algo – adding/removing platforms and weights became political	Label ontology and reward weights are DAO-governed with C2/C3 decision classes
Early-adopter entrenchment – early participants accumulated massive cred that diluted newcomers	Decay + inflation cap + individual accumulation cap
Off-boarding impossibility – cred was granted permanently with no removal mechanism	Decay burns tokens for inactivity; reputation can be slashed for misconduct
Complexity drove away users – the cred calculation was incomprehensible to non-technical users	sOS token economics are intentionally simple: earn by contributing, decay by disengaging

Core lesson: Automated contribution metrics are dangerous. sOS's defense is that meaningful rewards require human governance, not algorithms.

9.3 Optimism Retroactive Public Goods Funding (RPGF)

Optimism's RPGF model rewards public goods *retrospectively* (after value is demonstrated), using citizen-determined allocation rather than market pricing. This aligns with sOS's contribution-based approach and is directly analogous to how the DAO evaluates and rewards research contributions. RPGF's key finding: retrospective evaluation by reputation-weighted voters produces higher-quality allocation than real-time algorithmic rewards. sOS adopts this.

9.4 Colony and Coordinape

Colony's reputation-weighted task governance and Coordinape's peer-to-peer gratitude-based allocation are both prior art for sOS's DAO layer. sOS differs in: (a) rooting reputation in UILL identity rather than platform-bound accounts, (b) adding constitutional governance (C3) for systemic changes, (c) explicit MiCA/GDPR compliance architecture.

10. Open Economic Questions

1. **Optimal inflation rate.** Is 5% annual cap appropriate for a scientific DAO with ~50 active contributors? Too high (dilution) or too low (insufficient incentive)?
 2. **Decay rate calibration.** Is a 2-year half-life too aggressive for research contributions that take years to produce? Should research reputation decay differently from governance participation decay?
 3. **Value of governance.** In a non-profit, non-transferable token, what does "governance weight" mean psychologically and practically? How do you keep people engaged when tokens have no financial value?
 4. **Free-rider problem.** If tokens have no financial value and governance is work, why would anyone participate beyond the core team? The answer must be intrinsic motivation + reputation – but is that enough at scale?
 5. **Treasury diversification.** How much of the treasury should be in crypto vs. fiat? Crypto enables DAO-native operations but introduces volatility and custody risk.
 6. **Grant dependency.** If 80%+ of funding comes from EU grants, what happens during grant cycles gaps? How large must the treasury reserve be?
 7. **Labour law vs. token compensation.** Per WP9 §11.4, token compensation cannot replace salary without risking misclassification. How does this constraint shape the incentive model?
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11. Conclusion

The sOS token is designed to answer one question: **how do we govern a scientific research program without replicating the power structures we are trying to replace?**

The answer: governance through contribution, not purchase. Power that decays without engagement. Incentives aligned with scientific values, not financial returns. A token that represents membership, not wealth.

This is not the easiest token model. It is not the most profitable. It will not attract speculators or VCs. That is the point. sOS is building governance infrastructure for complexity, not another financial instrument. The tokenomics reflect that commitment.

Revised draft – Branch A (Pi/DeepSeek generative) + Branch B (Anthropic Opus 4.8 review) + Synthesis (Pi/DeepSeek arbitration). Revisions applied 2026-06-28: differentiated decay rates (research 4yr vs governance 2yr), labour-law separation (token=governance, fiat=compensation), fiat reserve floor (9 months opex), genesis self-allocation ratification requirement, prior art section (SBT/SourceCred failure analysis/RPGF/Colony), reputation-collusion defense escalation, metric-gaming defense. Pending Steward review.