



Standing Forest Token (SFT):

**A Nature-Based Currency
Centered on Forest Protectors**

WHITE PAPER DRAFT v1

May, 2025

Biodiversity Finance Innovation Alliance

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Support & Acknowledgements

This project was developed with support from Fundación Maquipucuna, Earth Analytic Inc., Puente Institute, Dr. Joey Yrisarri, Pennywise Foundation, Rainforest Trust, Bobolink Foundation, and Bezos Earth Fund. We're extremely grateful for contributions from Harold Hallstein, Gunthar Hartwig, Chris Mathias, Rodrigo Ontaneda.

We welcome continued dialogue and collaborative efforts to refine and strengthen this framework. For inquiries or to contribute to this work, please contact David Ontaneda at david.ontaneda@gmail.com or +1-778-681-2328.

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Executive Summary	1
1. INTRODUCTION: REIMAGINING TROPICAL FOREST CONSERVATION THROUGH INNOVATIVE FINANCE	2
2. THE STANDING FOREST TOKEN (SFT) CONCEPT	4
2.1 A New Asset Class: Standing Forests as Natural Capital	4
2.2 The Dual-Token System: SFTs and AVTs	5
3. TOKEN ECONOMICS AND INCENTIVE MODEL	9
3.1 Forest Eligibility Criteria for SFT Minting	9
3.2 SFT Supply, Distribution, and Scarcity	11
3.3 Royalty Mechanism: Continuous Rewards for Forest Protectors	13
3.4 Incentives for Forest Protectors and Other Stakeholders	15
4. PLATFORM ARCHITECTURE AND GOVERNANCE	18
4.1 System Architecture Overview	18
4.2 Decentralized Governance Concepts	22
4.3 User Experience (UX) Considerations	23
4.4 Stakeholder Roles & User Flow Diagrams	26
5. COMPARISON WITH CONVENTIONAL CARBON AND BIODIVERSITY MARKETS	31
5.1 Conventional Carbon Credit Markets	31
5.2 Emerging Biodiversity Credit Markets	34
5.3 Interoperability and Differentiation	35
6. LITERATURE REVIEW AND RELATED WORK	36
6.1 Financing Nature as an Asset	36
6.2 Nature-Based Currencies and Monetary Innovation	37
6.3 Market Mechanisms and Risks – Lessons Learned	39
7. RISK ANALYSIS	43
7.1 Environmental and Verification Risks	43
7.2 Financial and Market Risks	45
7.3 Technological Risks	47
7.4 Social and Ethical Risks	48
7.5 Regulatory and Legal Risks	52
8. IMPLEMENTATION ROADMAP & PROJECT UPDATES	54
9. CONCLUSION	59
APPENDIX A: GLOSSARY OF TERMS	62

Executive Summary

The **Standing Forest Token (SFT)** is a blockchain-based solution designed to bridge the tropical forest finance gap by valuing **standing forests as a new asset class**. It introduces a **dual-token system** to incentivize long-term forest conservation through market mechanisms. The two tokens are the Standing Forest Token (SFT) as a scarce, fungible token backed by real, verified hectares of tropical forest, and an Annual Verification Token (AVT) that captures yearly benefits such as carbon and biodiversity outcomes from those forests. Together, they form a visionary yet practical framework that rewards forest protectors for preservation and offers investors and corporations a transparent, impactful instrument for sustainability commitments through investment, not philanthropy. By tying economic value to **keeping forests alive rather than cutting them down**, the SFT ecosystem aims to realign incentives and unlock scalable funding for conservation. This white paper details the motivation, design, token economics, platform architecture, and implementation roadmap of the SFT project, positioning it against conventional carbon and biodiversity credit markets and drawing on emerging research in nature-backed finance. It concludes that the SFT represents a pioneering “nature-based currency” that can make forest protection economically competitive and sustainable, backed by credible governance and technological infrastructure.

1. Introduction: Reimagining Tropical Forest Conservation Through Innovative Finance

Tropical forests are the planet’s life-support systems, sequestering carbon, harboring unparalleled biodiversity, and regulating global climate patterns. Yet, they are vanishing at a relentless pace—over 11 million hectares lost annually—driven by economic incentives that prioritize short-term profit over long-term ecological stability. Deforestation is fueled by

industrial agriculture (e.g., soy, palm oil, cattle), logging, and mining, which generate immediate revenue for landowners and corporations. These activities are often enabled by global supply chains and weak governance, rendering forests more valuable when cleared than when left standing. This perverse economic logic places immense pressure on forest protectors—indigenous communities, local stewards, and conservation organizations—who face significant challenges in safeguarding these ecosystems.

Forest protectors operate in a landscape of systemic inequities. Indigenous communities, who steward 80% of the world’s remaining biodiversity, often lack legal land tenure, leaving them vulnerable to encroachment by loggers or agribusiness. Conservation organizations struggle with limited resources, competing against well-funded extractive industries. Both groups face financial precarity, as their efforts to maintain forests yield little direct income compared to deforestation’s windfalls. Moreover, they are frequently excluded from decision-making in global conservation frameworks, despite their critical role on the ground.

The climate finance gap exacerbates these challenges. Current funding for forest conservation—estimated at \$1.5 billion annually—falls far short of the \$100–\$200 billion needed yearly to halt deforestation and restore degraded lands. Traditional mechanisms like grants and REDD+ programs, while well-intentioned, are often inefficient, channeling funds through large intermediaries such as multilateral institutions or Big International NGOs. This top-down approach results in only a fraction of funds—sometimes as little as 10%—reaching on-the-ground stewards. Carbon markets, another cornerstone of climate finance, frequently fail to deliver equitable benefits, as their carbon-centric models are too narrow to encompass the true value of tropical primary forests, which includes biodiversity, cultural significance, and ecosystem resilience. They disproportionately reward corporations, enabling practices like monoculture plantations that replace biodiverse forests with low-value ecosystems, yet still qualify for carbon credits. Such oxymoronic outcomes—where forestry companies destroy pristine forests, plant monocultures, and profit from both timber and credits—undermine the integrity of conservation efforts and marginalize true forest protectors. The emerging

biodiversity credit market seeks to address this by valuing ecological diversity, but falls short of providing stable and scalable incentives due to its voluntary nature, the impossibility of quantifying global impacts to develop a meaningful obligatory market, and high startup costs for verification with little promise of return when voluntary markets falter for political or economic reasons. The concept of **additionality**, central to carbon markets, further hinders protection of the world's most valuable forests by requiring projects to demonstrate emissions reductions beyond a baseline. Sadly, this incentivizes companies to log old-growth high-biodiversity forests, plant monocultures for profit, and still claim credits for “new” sequestration. All the while, stewards protecting intact standing forests are excluded from this key financing mechanism because their critical impact is not valued by the existing system.

This misalignment demands a paradigm shift. Economic incentives must be restructured to make forest conservation financially competitive with extractive industries that drive deforestation. Innovative, scalable financial mechanisms are needed to directly empower forest protectors, ensuring they are rewarded for preserving ecosystems in perpetuity. By bridging the climate finance gap with distributed, market-driven solutions, we can transform tropical forests into valued natural capital, aligning the interests of stewards, investors, and the planet.

The Standing Forest Token (SFT) emerges as a visionary solution to this challenge. The core idea is to create a **market-driven economy for forest conservation**, where intact forests are assigned real financial value as *natural capital assets*. By leveraging blockchain technology, SFT envisions a transparent and decentralized platform where forest protection is incentivized through digital tokens. Each token is underpinned by the ecological value of a specific forest area, flipping the script so that value is derived from **leaving trees intact** rather than extracting them. This aligns with emerging ideas in sustainable finance that call for treating nature as critical infrastructure and backing economic value with ecological assets. For instance, thought leaders have suggested that “**forests, coral reefs and pristine ecosystems [could be] the gold we must protect as a reserve that supports our economy**,” implying that currencies should increase in value when we conserve nature and collapse if we destroy it. (OpenEarth, 2023). The SFT

concept is a concrete step toward such a paradigm, embedding the value of standing forests into a tradable token system.

In summary, The SFT is introduced as a **visionary, scalable approach to address the tropical forest finance gap**. It seeks to mobilize private and public capital by creating a new asset class—**verified standing forests**—and a supporting token ecosystem. The sections that follow will define the SFT system in detail, compare it with existing carbon and biodiversity markets, and elaborate on the economics, governance, and implementation of this novel mechanism.

2. The Standing Forest Token (SFT) Concept

2.1 A New Asset Class: Standing Forests as Natural Capital

The **Standing Forest Token** represents a **new asset class** in which **standing tropical forests** are the unit of value. Unlike traditional commodities or land titles, SFTs are value proxies- existing as digital tokens representing one hectare of verified, living forest - whose market dynamics provide tangible ecological outcomes, directly supporting biodiversity and carbon sequestration through forest preservation. By defining **verified tropical primary forests** as a scarce asset (there are a limited number of intact hectares remaining globally), SFT leverages scarcity to drive value. Only forests that meet stringent criteria (e.g. primary or high-biodiversity forests with legal protection and active stewardship) can be tokenized, ensuring that each SFT is “backed” by real conservation value.

Token Scarcity and Value: SFT’s value proposition relies on scarcity and long-term appreciation. We estimate an upper limit of about **1 billion hectares** of tropical primary forest remaining worldwide. Therefore, the SFT supply has a hard cap of 1 billion tokens, representing the theoretical maximum number of hectares that could be protected by this mechanism. In practice, SFTs will only be minted as new forest areas are enrolled, so the circulating supply grows in tandem with real conservation. If the full cap is ever reached, it would mean one billion hectares of protected tropical forest are financed via the SFT ecosystem. By constraining supply

and tying it to an environmental reality, the concept of an SFT introduces **digital scarcity** that mirrors physical scarcity. Similar in spirit to Bitcoin’s 21 million token supply cap, but backed by tangible natural assets. This scarcity is designed to make SFT attractive to investors: as climate and biodiversity crises worsen, **intact forests become ever more valuable and rare**, potentially driving up token demand. SFT holders essentially own a piece of this global natural capital reserve.

Crucially, **SFT value is not derived from extracting resources**. No logging or carbon emissions are needed to monetize it. Instead, value grows from **ecosystem preservation** and the *trust* that each token represents a verifiable hectare of protected forest. This resembles the notion of a “**nature-backed currency**”. Rather than gold or fiat guarantees, the token is **backed by the living biomass and biodiversity** in an ecosystem. In economic terms, SFT can act as a **store of value** and a hedge. Much like gold is a hedge against inflation or turmoil, standing tropical forests (via SFTs) could hedge against climate risk and future regulatory changes by securing essential ecosystem functions. Both buyers and sellers benefit. Land stewards gain a monetizable asset for their conservation work, and investors gain a scarce asset that could appreciate as ecological crisis deepens (and which also fulfills ESG objectives).

2.2 The Dual-Token System: SFTs and AVTs

To operationalize this vision, the Standing Forest Token ecosystem employs a **dual-token system**:

- **SFT (Standing Forest Token)** – a fungible base token (envisioned as an ERC-20 or equivalent) representing a stake in a specific forest project (one token per hectare). SFTs are tradable in open markets, providing liquidity and price discovery for the conservation asset. Think of SFT as akin to a “**forest-backed currency**” or a share in the conserved asset.
- **AVT (Annual Verification Token)** – a non-fungible token (ERC-721 standard or similar) minted yearly for each hectare under protection, representing the verified **annual ecosystem service outcomes** (specifically carbon sequestration and biodiversity

conservation results) of that hectare. AVTs are **linked to SFTs**: for every SFT (hectare) in the system, each year an AVT can be issued if the forest remains protected and meets verification standards. An AVT is essentially a **bundle of environmental credits** – it bundles the carbon credits and biodiversity credits generated by one hectare in one year, with data from monitoring reports.

The SFT and AVT are designed to work in tandem, creating both a **stock** and a **flow** token:

- The **SFT is the stock asset** – it is issued to represent the long-term conservation state of a forest area. Once an SFT is issued for a hectare, it remains in circulation as long as that hectare stays within the program. If the forest is lost or withdrawn, the SFT would be retired or burned, reflecting loss of the asset. SFTs can be traded among investors, enabling a **market value for standing forests** to emerge.
- The **AVT is the flow (yield)** – it is analogous to a dividend or coupon that the forest “pays” each year to forest protectors in the form of ecosystem service credits. AVTs can be sold to generate ongoing revenue. Importantly, **SFT holders who stake their SFT to a given forest parcel must purchase (with the option to retire) that parcel’s AVTs**. While they would still be able to resell those AVT’s on the secondary market, this mechanism ensures that forests with staked SFTs are not left with unsold AVTs. The goal is that environmental claims (like carbon neutrality pledges) are backed by *long-term involvement* in the specific forest, not just one-off credit purchases. This provides an incentive to stake SFTs to forests with sought after AVTs. Secondary AVT sales may command higher royalties and could even be customizable by the forest protector (i.e., the original minter). - An alternative model to be considered would be that an investor cannot simply buy an AVT unless they are also invested in the forest’s SFT – this would link credit retirement with sustained stewardship but would render a secondary AVT market impossible.

Bundling Credits: Each AVT represents a **bundle of carbon and biodiversity credits** verified for that hectare-year. In practice, this means that for a given forest project, its annual monitoring

might yield, say, X tonnes of CO₂ sequestered (carbon credits) and a quantified biodiversity outcome (such as habitat condition improvement or species population maintained, translated into “biodiversity credits”). Instead of handling these separately, the AVT **aggregates the value** into one token. The pricing of each AVT can be project-specific and reflective of the credits available. For example, a hectare in an old-growth cloud-forest might sequester more carbon and harbor richer biodiversity (Natural Capital) than a hectare of Amazon rainforest, which might in turn harbour more natural capital than another tropical forest; thus its AVT could carry a higher price or be split into multiple units. The platform will transparently show the underlying metrics of each AVT (e.g., 80 tons CO₂ + biodiversity credits) so that buyers understand what environmental benefit they are purchasing. By **stacking carbon and biodiversity value together**, SFT’s AVT design ensures that conservation efforts are rewarded holistically. This is an improvement over traditional models where carbon credits and biodiversity credits are siloed markets – here, they are integrated, potentially reducing fragmentation and increasing buyer appeal (one purchase supports both climate and nature).

Interoperability with Standards: SFT and AVT are not meant to replace existing credit standards but to interoperate with them. The **AVT issuance and retirement protocols align with established carbon and biodiversity crediting standards** wherever possible. For carbon, this could mean verifying according to methodologies from the Open Forest Protocol, while still potentially accepting those which use Verra or Gold Standard (as long as other criteria are also met – especially regarding conservation commitments), and for biodiversity using emerging frameworks such as the ERA Umbrella Species Methodology for Biodiversity Credits. By ensuring that each AVT is underpinned by **verified credits** that could, if needed, be translated into the existing credit market, the system gains credibility and compatibility. In essence, an AVT can be seen as a **“wrapper”** around standard credits – making them easier to handle in one token but still recognizable to buyers who require specific claims (e.g., a company can say an AVT retirement covered Y tons of CO₂ and contributed to species protection in area Z). This interoperability also means projects already generating credits could **integrate with the SFT**

system: they continue their monitoring and verification and receive their SFTs, but no AVTs if they are already sold or hosted on a registry that is not compatible for collective accounting.

Comparison to Asset-Backed Securities: The SFT dual-token structure, comparable to Bitcoin as a scarce digital asset but tied to real-world value, is distinct from financial securities, representing a true natural asset for tropical forest protection. The SFT is akin to a stewardship token in a conserved forest hectare, while AVTs, minted annually to forest protectors, represent verified ecosystem service credits (e.g., carbon, biodiversity) with market value. Unlike stocks or bonds promising dividends, SFTs do not guarantee returns; their value reflects the ecological integrity of the protected forest. The better a forest is safeguarded, the more valuable the AVTs minted to protectors, which may increase market demand for SFTs as tokens of high-integrity conservation, aligning investor interest with long-term ecological outcomes.

In summary, the dual-token SFT/AVT system provides a **comprehensive representation of forest value**: SFT captures the **intrinsic, long-term value of the conserved asset**, and AVT captures the **periodic, measurable outputs of conservation**. This system incentivizes both **holding and stewardship (via SFT)** and **active annual performance (via AVT)**, creating a feedback loop that financially rewards keeping forests alive year after year.

The next sections delve into how the token economics are structured to sustain this model and how the platform is architected to implement it.

3. Token Economics and Incentive Model

The economic design of SFT and AVT is crucial to align incentives of all participants — forest stewards, token holders, and the broader market — towards the shared goal of forest conservation. This section describes the **token supply, distribution, royalty mechanism, and the incentives** embedded in the system for various stakeholders.

3.1 Forest Eligibility Criteria for SFT Minting

The Standing Forest Token (SFT) is designed to protect 1 billion hectares of primary tropical forest, the estimated global extent of such ecosystems, with a hardcoded maximum supply of 1 billion SFTs, each representing one hectare. To ensure the platform targets forests with the highest biodiversity and ecosystem value, clear eligibility criteria are established, balancing ecological integrity, community stewardship, and practical implementation. These criteria define eligible forests, consider regenerated forests under specific conditions, and leverage advanced mapping to identify target areas.

Definition of Primary Tropical Forest: Primary tropical forests are defined as intact, naturally occurring forests in tropical regions (between 23.5°N and 23.5°S) with minimal human disturbance, characterized by high biodiversity, complex ecosystem structures, and significant carbon storage. They exhibit mature tree cover, diverse species assemblages, and continuous canopy cover, as verified by ecological assessments aligned with frameworks like the FAO's Forest Resources Assessment and the High Conservation Value (HCV) approach. These forests exclude areas with significant logging, agricultural conversion, or infrastructure development within the past 50 years, ensuring only ecosystems with long-term ecological stability qualify for SFT minting.

Inclusion of Regenerated Forests: Regenerated forests with high biodiversity value may be eligible for SFT minting under strict conditions to complement the focus on primary forests. To qualify, regenerated forests must demonstrate biodiversity and ecosystem services comparable to primary forests, as assessed through metrics like species richness, endemism, and carbon sequestration potential. Eligibility requires: (1) at least 30 years of natural regeneration without active management (e.g., plantations), verified by historical satellite data; (2) alignment with biodiversity crediting methodologies, such as those from the Wallacea Trust or Verra's Biodiversity Assessment Methodology; and (3) active stewardship by indigenous or local communities, prioritizing areas under customary tenure. Regenerated forests will be capped at

10% of total SFT issuance (100 million tokens) to maintain the primacy of intact ecosystems while supporting restoration efforts.

Initial Mapping and Remote Sensing: To estimate the global extent of primary tropical forests, the SFT platform will integrate a baseline map using advanced remote sensing and existing datasets, updated annually to reflect forest loss or regeneration. Key tools include: (1) Global Forest Watch (GFW) for high-resolution canopy cover and deforestation data; (2) Hansen et al.'s forest loss datasets (2000–2024) to identify intact areas; (3) Tropical Moist Forest (TMF) datasets from the Joint Research Centre to map undisturbed humid forests; and (4) IUCN Red List and Key Biodiversity Areas (KBA) to prioritize high-biodiversity zones. Initial mapping will be validated through ground-truthing by local partners and indigenous stewards, ensuring community input. This baseline, estimated at 1 billion hectares, will guide SFT minting, with ongoing monitoring to adjust eligibility as new data emerges or forests regenerate to meet criteria.

Integration with Biodiversity Methodologies: Where direct answers to eligibility are complex (e.g., quantifying biodiversity value), the SFT platform will adopt established biodiversity crediting methodologies to ensure rigor. Protocols from ERA's Umbrella Species Methodology, Plan Vivo, and the Global Biodiversity Standard will inform assessments, focusing on measurable indicators like species diversity, habitat connectivity, and ecosystem resilience. For regenerated forests, methodologies will be harmonized to avoid double-counting with carbon credits, ensuring SFTs reflect unique ecological contributions. Uncertainties, such as variable regeneration timelines, will be addressed through conservative thresholds and third-party audits, maintaining credibility and stakeholder trust.

By defining primary tropical forests, selectively including high-value regenerated forests, and leveraging robust mapping, the SFT platform ensures that token issuance aligns with the highest standards of ecological and social integrity, protecting the world's most critical ecosystems while empowering their stewards.

3.2 SFT Supply, Distribution, and Scarcity

As introduced, the **maximum supply of SFTs is capped at 1,000,000,000 tokens** (1 billion), corresponding to roughly the total hectares of tropical primary forest left globally. This cap creates a sense of **digital scarcity tied to ecological scarcity**, potentially driving value appreciation as more forests are protected and the remaining token minting capacity decreases. However, reaching the cap is a far aspiration; in practice, SFT issuance will be gradual and driven by forest protector onboarding speed.

Minting Process: SFTs are *not* pre-minted up to the cap; they are minted *per project* when new forests are onboarded. Each forest project that joins the platform will have an **allocation of SFTs proportional to its area** (1 token per hectare, assuming full verification). To ensure robustness, SFT minting is done in a **two-phase process**:

- **Phase 1: Preliminary Minting (e.g., 30%)** – Once a project’s **land tenure and legal protection status are verified**, a portion of its SFT allocation is immediately minted with 2% reserved to cover initial verification expenses. This early issuance (for example, 28% of total tokens for that project) gives the forest steward upfront liquidity. They can sell these SFTs to raise funds for second phase verification, community engagement, and to finance protection activities. Alternatively, an optional mechanism can automatically direct a slice (say 5-10%) of this initial issuance to accredited verifiers or supporting partners, covering the costs of the next verification phase without burdening the steward.
- **Phase 2: Full Minting (remaining 70%)** – The rest of the SFTs for the project are minted only **after comprehensive on-site verification** of the forest’s carbon stocks and biodiversity value. This typically involves experts measuring biomass, assessing species presence, etc., to establish the baseline ecological value. By conditioning the majority of token issuance on this step, the system ensures due diligence and **rewards thorough verification**. Stewards get the bulk of their tokens (and thus potential funding) **only**

when the forest's high conservation value is confirmed. This phased approach mitigates risk: if a project fails to verify (e.g., the forest wasn't as intact as claimed), the remaining tokens are not minted, protecting the integrity of SFT supply.

Initial Allocation: All SFTs for a project are initially allocated to the **Forest Steward** (the entity responsible for that land, e.g., an indigenous community, a conservation NGO, or a private reserve owner). This is essentially a grant of digital assets to the steward in exchange for committing to protect the forest. The steward can then decide to hold some tokens and sell others. Selling SFTs on the open market is how the steward **raises finance**. Early buyers of those SFTs provide capital that goes directly to conservation activities on the ground.

Token Holding and Staking: A unique feature is that **SFT holders are encouraged to “stake” their tokens to specific forest parcels on the platform.** Staking in this context means linking one's token to the actual hectare it originated from (the system will have a map interface where an investor can see the forest and symbolically pin their SFT to it). Staking doesn't lock the token in a technical sense (the holder can un-stake and trade anytime), but it is a prerequisite to claim (through purchase) that parcel's AVTs. This creates a public association between the investor and the forest, catering to impact investors' desire for traceability – you can literally see *which* forest your investment is supporting. It also deters speculative flippers from holding SFT stakes without caring about the project, since maintaining a stake in a specific forest requires the annual purchase of its associated AVT's.

Scarcity Dynamics: Over time, as more hectares are tokenized, the **available supply headroom decreases**. If SFT gains popularity, early tokens might become more valuable due to scarcity of high-quality forest projects or simply because the cap is in sight. However, to avoid unhealthy speculative bubbles, the platform may implement a **slow release schedule** or curbs if needed. Importantly, since each token is tied to a forest, the concept of fungibility has a nuance: any SFT token is interchangeable on a market level, but savvy investors might prefer tokens from certain projects (if they intend to stake for access to high value AVTs). This could create a market

dynamic where some SFTs trade at a slight premium if the underlying forest's annual AVTs are expected to be very valuable, whereas others might trade at discount if the forest is lower productivity. However, as a **fungible class**, they are all SFTs and the baseline value driver is the idea of one hectare protected. Market mechanisms will sort out these differences, possibly via on-chain metadata or ratings for each project.

In essence, SFT's supply mechanism and distribution are engineered to reward stewards, ensure verification, and create a credible scarcity-based value. Early token buyers fund protection, and as the supply grows, it directly corresponds to real-world conservation scale (a sort of "proof of conservation").

3.3 Royalty Mechanism: Continuous Rewards for Forest Protectors

One of the most innovative aspects of SFT's economics is the built-in **royalty model** that continuously channels benefits to the original forest stewards. This is inspired by the concept of creator royalties in NFTs and is made possible by smart contracts governing the tokens. The logic is as follows:

Whenever an SFT is traded (transferred from one wallet to another in a sale on a supported marketplace or exchange), a small percentage of that transaction's value is automatically redirected as a **royalty or commission to the steward** who manages the corresponding forest. In practice, there may be an automated mechanism that proportionally distributes all royalties collected to SFT minters (forest protectors). The white paper envisages a royalty in the range of **2–5% of each trade's value**.

For example, if an SFT token sells for \$1000 in a secondary market:

- A 3% royalty would take \$30 from that and distribute it proportionally to the wallets of the forest stewards (or a community fund they control).
- The seller of the SFT receives \$970 instead of the full \$1000 (similar to how art NFTs reward the original artist on resales).

- The buyer gets the SFT as usual, and this SFT is now associated with an ongoing support stream to the forest.

This mechanism ensures **forest communities continue to benefit even after the initial token sale**. It acknowledges that conservation is an ongoing service. If the token appreciates over time (say that \$1000 token later resells for \$5000), the stewards would get \$150 from that resale, capturing some of the appreciation value that their conservation work helped create. Over numerous transactions across potentially many tokens, this could become a substantial **recurrent revenue stream for local stewards**, helping cover patrols, maintenance, community development, etc. It essentially makes the forest steward a **perpetual stakeholder in the token's economic journey**, preventing the scenario where they sell tokens once and then are left out of future gains.

From an investor's perspective, this royalty is a known feature and considered a **transaction cost of supporting impact**. Serious ESG investors are usually willing to accept a small fee that goes to the project they're supporting. Furthermore, the existence of royalties may encourage **longer-term holding of SFTs** (to avoid paying the fee on quick flips), thus aligning with the goal of having committed stakeholders rather than speculators.

It's important that the royalty percentage is set judiciously: too high might deter trading and liquidity; too low might not meaningfully benefit stewards. The chosen 2-5% is in line with common NFT royalties and is generally seen as moderate. Additionally, smart contracts can be designed so that these royalties are **enforced** at the protocol level, meaning even if SFTs trade on decentralized exchanges or peer-to-peer, the contract will automatically take the cut for the steward's address. (One challenge: not all trading venues honor on-chain royalties by default, but by controlling the official SFT contract and marketplace, the platform can ensure most volume goes through royalty-respecting channels).

Beyond SFT trades, another form of ongoing reward is the **proceeds from AVT sales**.

In summary, the token economics ensure **multi-tiered incentives**:

- **Upfront funding** from initial SFT sales.
- **Continual income** from AVT issuance (annual credit revenues).
- **Long-term windfalls** from SFT royalties on every trade.

This trifecta (initial, ongoing, long-term) is designed to **make forest stewardship financially sustainable and attractive**. It is effectively creating an economy where conservation work is rewarded much like a service contract or a production operation, but with market-driven pricing.

3.4 Incentives for Forest Protectors and Other Stakeholders

Forest Stewards (Supply Side): As described, stewards are the primary beneficiaries of token issuance and royalties. By participating, they gain:

- **Capital without Debt or Equity Loss:** SFTs are not debt that must be repaid, nor do they require the community to give up ownership of land (the land remains theirs; they are simply monetizing its conservation value). It's akin to receiving a new asset they can liquidate as needed. This is powerful for indigenous groups or local NGOs who might lack access to loans and often see themselves forced to sell land rights to survive. SFT monetizes *conservation outcomes* instead of extraction rights.
- **Annual Performance Payments:** Continued protection yields AVTs that translate to funds each year. This is like having an **annual paycheck for keeping the forest intact**, filling a gap where normally only extractive use would yield income.
- **Empowerment and Autonomy:** With the platform's global reach, even small communities can plug into international markets directly. They can see the prices, choose when to sell tokens, and plan their finances, rather than relying solely on donor grants or government subsidies.
- **Technical Support:** The SFT platform will likely offer tools for monitoring (possibly apps or partnerships to get satellite data) to help stewards meet verification needs, lowering

the technical barriers for participation. Also, initial verifications can be facilitated as mentioned.

Investors and Buyers (Demand Side): There are a few categories here:

- **Impact Investors/Token Holders:** Those who buy SFTs as a form of **impact investment** or speculation. Their incentive is twofold: potential financial return if token value increases, and the knowledge that their money went to a good cause (with proof via the forest link). The staking mechanism and access to AVTs give them a **tangible link to impact**, which is rare in other investments. Additionally, if they stake, they receive access to purchase AVTs which they can **sell for profit or retire for ESG goals**.
- **Corporate Sustainability Buyers:** Companies seeking to offset emissions or achieve biodiversity net gain can engage. Their incentive is that by buying and staking SFT in a forest, they secure a pipeline of verified credits (AVTs) over years, providing **supply certainty** for their offsetting needs. Also, it provides a stronger narrative: instead of saying “we bought offsets from various projects on the market,” a company can say “we have invested in protecting X hectares of forest in Y region, and every year we retire the credits from that forest to offset our footprint.” This is powerful for storytelling and stakeholder trust, as it demonstrates a deeper commitment.
- **Speculators/Traders:** There will likely be crypto market participants who trade SFT for profit without much regard for the environment. While they are not the primary target audience, their participation can add liquidity and discover price. The design still ensures that even these actors contribute to the cause via the royalty mechanism (every trade funds conservation) and by maintaining demand for tokens (which indirectly supports token price for stewards). In a way, even pure speculators end up funding forests through the fees.

Verifiers and Standards Bodies: The SFT system will involve independent verifiers to check forest status and measure outcomes. This could create a steady flow of work for such entities (scientists, auditors, local verifiers), incentivizing the growth of a **verification economy** around conservation, which is a positive externality – more jobs in protecting and studying forests.

Standards organizations might also partner to certify the AVT calculations. They get a new avenue to apply their methodologies and ensure quality.

Platform/Governance: There may be a governing foundation or DAO (decentralized autonomous organization) that oversees the SFT ecosystem (more in Section 5). The token economics could include a **small platform fee** or allocation of tokens to a treasury for long-term development, ensuring the platform’s sustainability. For example, maybe 1-2% of SFT from each project is allocated to a foundation wallet to fund operations, improvements, or an insurance pool (for instance, to compensate if any forest suffers loss unexpectedly – a kind of buffer or “risk pool” token reserve).

Broader Stakeholders (Global Community): If SFT succeeds, the global community benefits from more forests standing (climate mitigation, biodiversity, etc.). While not a direct incentive, aligning profit with the public good ideally attracts **impact-driven capital at scale** – including possibly **Climate Funds, impact funds, or even governments** wanting to leverage private markets. They could buy SFTs or AVTs as part of their climate finance spending, essentially using the market mechanism to channel money effectively to communities.

In conclusion, the token economics of SFT/AVT are engineered to create a **self-sustaining financial loop**:

1. Investors put money in – receiving SFTs as tangible assets that may appreciate as the market recognizes the value of the last intact primary tropical forests.
2. Stewards get funded to protect forests, ensuring their permanence.
3. Standing Forests generate verified outcomes that supply the market with high-integrity credits.
4. Credits are purchased and retired by ESG buyers seeking to demonstrate their positive impact and stewards get ongoing rewards.
5. Investors can trade SFTs or AVTs for a profit, while stewards benefit from royalties.

6. The establishment of Standing Tropical Forests as an asset class and store of value answers the demand for sustainable investments, which keeps funding flowing in.

Over time, this could scale up exponentially, ideally until the goal of minting 1 billion tokens (hectares protected) is reached. The next part of this paper will describe how the system can be technically implemented and governed.

4. Platform Architecture and Governance

A robust platform underpins the SFT system, combining blockchain technology, digital monitoring, and user interfaces that cater to various stakeholders. This section outlines the envisioned **system architecture**, including the token technology stack, the verification and data layers, and considerations for **decentralized governance** and user experience.

4.1 System Architecture Overview

At its core, the SFT platform is a **multi-layered application** that integrates:

- **Blockchain Layer:** Provides the ledger for SFT and AVT tokens, smart contracts for token logic (minting, royalty distribution, staking records, etc.), and transaction immutability/transparentcy. We anticipate using a **public, energy-efficient blockchain** (for example, Solana, Phantom or Ethereum (Proof-of-Stake) or a similar chain with smart contract support) to ensure openness and interoperability. Tokens would adhere to known standards (ERC-20 for SFT, ERC-721 or ERC-1155 for AVT) so they can be held in standard wallets.
- **Data & Oracle Layer:** Connects real-world forest data to the blockchain. This includes satellite imagery feeds, IoT sensors (if any on the ground), and databases of verification reports. “Oracle” mechanisms would feed yearly verification results (forest integrity, carbon metrics, biodiversity assessments) into the smart contracts that trigger AVT

minting. This might be semi-automated: for example, an accredited verifier signs off on data, which is then uploaded to the blockchain (perhaps via IPFS for storage of detailed reports, with a hash stored on-chain as proof).

- **Application Layer:** The user-facing platform (web interface, mobile app) where different users interact:
 - **Forest Stewards** can onboard their project, upload required documents (proof of land ownership, conservation agreements, baseline data), and later see token distribution, manage any tokens they hold, and track their forest's health data as collected by the system.
 - **Investors/Buyers** can directly purchase SFTs and browse a **map-based interface** showing available forest projects for staking (each represented by their hectares and tokens). They could filter by region, forest type, co-benefits, etc. The interface would show, for each project, details like total area, tokens issued, carbon stock, biodiversity highlights, and perhaps a rating or verification stamp. Investors can buy SFT directly from stewards (initial issuance) or from the secondary market. The platform might have an integrated marketplace for primary sales and a connection to external exchanges for secondary trading. Once they hold SFTs, the app allows them to stake tokens to the project (this could be a one-click action since the project is known), and purchase associated AVTs each year.
 - **AVT Marketplace:** A section for sustainability-focused buyers (like companies) to purchase and **retire AVTs**. While AVTs can also be sold peer-to-peer, many will likely be bought for retirement (to claim the underlying credits). The platform can facilitate retirement (burning the token and issuing a certificate to the buyer stating what was retired, e.g., "this certificate attests that 1 AVT from Project X, representing 80 tons CO₂ and biodiversity conservation for 1 ha in year 2026, was retired on date Y for Buyer Z").
 - **General Public:** Even non-buyers could view the map and see what areas are protected via SFT. This transparency can raise awareness. There might be an

option to donate or support projects without buying tokens, for more traditional donors.

- **Smart Contracts & Logic:** Several key contracts make the system work:
 - **SFT Token Contract:** Manages SFT supply, initial minting (likely controlled by a project onboarding contract or a multi-sig committee that approves new projects), and enforces the royalty on transfers. It might also have a function to record a “stake” (link between a token ID and a project ID) or that might be a separate staking contract.
 - **AVT Token Contract:** Manages minting of AVTs. It would be tied to an annual cycle. For each project (or even each specific SFT token ID representing a hectare), it allows one AVT mint per year if conditions are met. It likely requires a call from an authorized oracle or account (post verification) to mint. The AVT token carries metadata linking it to the project, year, and metrics (tonnes CO₂, etc.). It also has a function to **retire** tokens (burn) and possibly directly trigger any associated climate accounting (some systems auto-report to registries on burn).
 - **Project Registry / Onboarding Contract:** Keeps track of all enrolled forest projects, their attributes, and their associated token supply. This is used in the initial mint and could store the mapping of token IDs to GPS coordinates or project IDs (likely large metadata stored off-chain but referenced).
 - **Royalty Distributor:** A contract (or built into SFT contract via ERC-2981 standard for royalties) that automatically allocates the percentage of each sale to the right address (the steward’s address on file).
 - **Governance Contract(s):** If a DAO is involved, contracts that allow SFT holders or a governance token to vote on parameters (like adjusting royalty %, approving new verifier partnerships, updating oracle sources, etc.).
- **Digital Monitoring Reporting and Verification (dMRV):** The platform will integrate **dMRV tools** to gather data. This could involve:

- Satellite monitoring for deforestation alerts (e.g., using services like Global Forest Watch or custom analysis to ensure no forest cover loss).
- Carbon stock modeling tools to estimate growth or emissions.
- Biodiversity monitoring protocols, which might include community-based observations or bioacoustics. While some of this is off-chain, the **results** funnel in as data inputs. The architecture might include a **data dashboard** for each project where verifiers upload annual reports. Modern approaches could even employ AI to analyze satellite or drone imagery for metrics like tree density or wildlife signs.
- **Security and Reliability:** The blockchain layer ensures tamper-proof recording of token issuance and retirement – critical for trust (no double issuance of credits, no manipulation of supply). Smart contracts will be audited to prevent exploits (especially since value is involved). Additionally, sensitive data (like exact landowner identities or documents) might be kept off-chain in secure storage with only references on-chain, to balance transparency with privacy.

In summary, the architecture marries **decentralized ledger tech with real-world environmental data streams** and user-friendly interfaces. It aims to be an **accessible and formal system**: accessible, in that users do not need deep crypto knowledge to participate (the UI will abstract complexities, possibly even allowing logins or custodial wallets for those unfamiliar with Web3), and formal, in that it adheres to standards and can integrate with formal markets or reporting frameworks.

4.2 Decentralized Governance Concepts

While the SFT platform may start under the guidance of a core team or foundation (to bootstrap the system, onboard initial projects, and ensure quality control), the vision includes moving towards **decentralized governance** to involve the community in decision-making. This could take the form of a **DAO (Decentralized Autonomous Organization)** comprised of stakeholders such as SFT holders, partner organizations, and even representatives of forest communities.

Potential governance features and questions left open for future development include:

- **Protocol Upgrades and Parameters:** Who decides if the royalty should be adjusted, or if the AVT formula should change (for instance, including new metrics or splitting carbon and biodiversity into separate token classes)? A decentralized governance model could allow token holders to vote on proposals for such changes, ensuring the system can evolve and adapt democratically.
- **Onboarding New Projects:** In a mature state, there could be far more forest areas wanting to join than the core team can handle. A governance system might be established where **DAO members vote to approve new forest projects** based on set criteria. Alternatively, regional DAO sub-committees could vet projects. This community-driven approach could scale the review process and add legitimacy (projects approved by a wide range of stakeholders, including peers).
- **Slashing and Enforcement:** If a forest is found to be non-compliant (e.g., significant illegal logging happened and the steward failed to report or address it), governance might vote to take actions like freezing further AVT issuance, slashing some of the steward's retained tokens, or in extreme cases, revoking the project (and possibly auctioning its SFTs to fund restoration). These are delicate operations (since they affect livelihoods and trust) and would need defined rules, but a decentralized approach can help ensure fairness and avoid centralized abuse.
- **Treasury and Funds:** If a percentage of tokens or fees go to a treasury, the DAO could vote on how to use those funds – be it marketing the SFT to more buyers, funding technology improvements, or even financing conservation research or insurance pools (e.g., to compensate projects that suffer force majeure losses like wildfires).
- **Multi-stakeholder Involvement:** To truly uphold equity, the governance could assign voting weight or special roles to **forest communities and stewards**. For instance, a council of stewards could have veto power on proposals that drastically affect on-the-ground operations. Designing governance to amplify the voice of those typically marginalized in global finance (e.g., indigenous groups) would be aligned with the ethos

of the project. This might be implemented via a bicameral model (two houses: one token-based, one member-based).

- **Transparency and Accountability:** All governance decisions, votes, and treasury expenditures would be recorded on-chain or at least published openly, which builds trust with external observers (critical if we want NGOs, governments, and the public to accept SFT as credible).

Because decentralized governance is complex, the white paper intentionally leaves specifics open, acknowledging that initial **centralized coordination may give way to decentralization gradually**. The immediate focus is to prove the system works; governance can become more open as the community grows. This concept is similar to how some crypto projects launch with a foundation and later transition to DAO control.

4.3 User Experience (UX) Considerations

The success of SFT relies not just on theory but on practical adoption, so user experience is paramount. The platform must cater to very different user groups: from a forest protector in the Amazon who may have a smartphone and is trusting this system to pay her community for forest protection, to a Wall Street ESG fund manager who wants to add SFTs to their portfolio, to a crypto trader on Uniswap. Balancing simplicity with functionality is key. Some UX considerations and features:

- **Localization & Accessibility:** The interface for forest stewards should be available in local languages (Spanish, Portuguese, Indonesian, French, etc., for tropical regions) and use simple terminology (perhaps avoiding crypto jargon). Onboarding flows should guide users through each step, possibly with a human support channel. For many communities, an intermediary (like an NGO or local partner) might help facilitate the process; the platform should support roles for such partners.
- **Education and Transparency:** Since this is a novel concept, built-in tutorials or explainer pop-ups can help. For example, when an investor first buys SFT, the system can show: “You have just purchased X hectares of forest protection. Here’s what you can do next:

stake it to the forest, track its impact, or trade.” For corporate users, providing documentation on how to account for AVTs in their sustainability reporting will be useful.

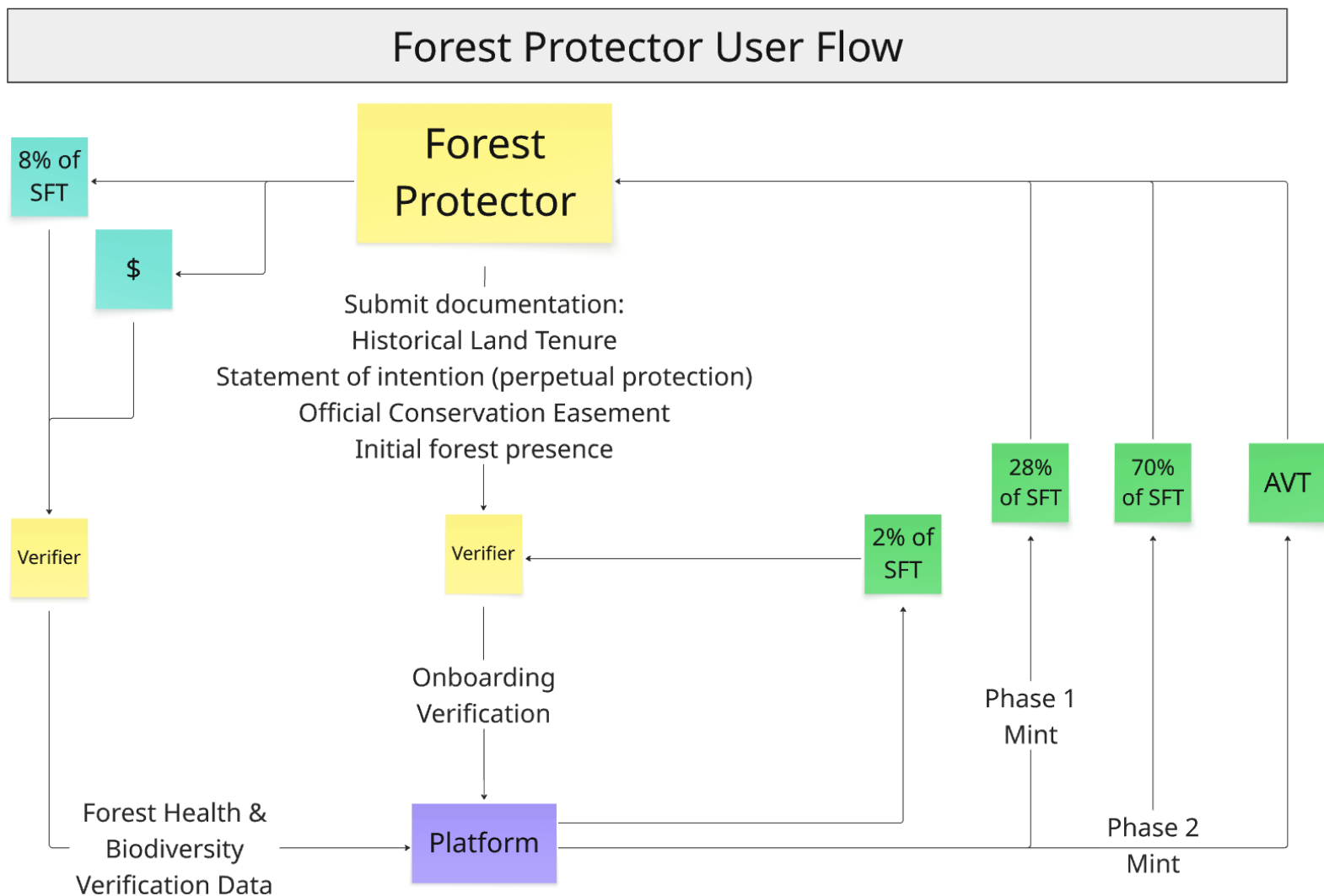
- **Seamless Transactions:** Many users might not be familiar with crypto wallets or managing private keys. The platform could offer a custodial wallet option (with strong security) so that users can simply create an account with email/2FA and the platform manages the wallet behind the scenes. Advanced users can connect their own wallets (via MetaMask, etc.). Payments for token purchases could allow fiat on-ramps (credit card, bank transfer) in addition to crypto, broadening access.
- **Visualizing Impact:** A compelling feature is the **map visualization**. Users can see satellite imagery or maps of the forest they are supporting. Over time, as data comes in, they might see changes or confirm no change (which is good, meaning no deforestation). Graphs could show carbon sequestered over the years, wildlife sightings, etc. This turns abstract tokens into a tangible story.
- **Notifications:** The system can notify SFT holders of important events – e.g., “The 2025 verification for your staked forest is complete, AVTs have been issued. Purchase them now to maintain your stake,” or alert a steward “Satellite data shows a possible forest loss in parcel 12, please check and report.” Early warning systems for deforestation can empower stewards to act quickly (possibly with support from the community or authorities).
- **Stakeholder Portals:** In addition to stewards and investors, consider a **Verifier Portal** (where auditors upload results, which then trigger AVT mint proposals on-chain), and a **Partner Portal** (for organizations like conservation NGOs or government agencies who want an overview of multiple projects or to contribute funds across projects).
- **Scalability & Performance:** Using blockchain could raise issues of transaction fees and speed. The platform might employ layer-2 solutions or sidechains for cheaper transactions, or batch operations (minting a thousand AVTs at once in one transaction, etc.). Users should not have to pay high gas fees manually; ideally, the platform abstracts those, maybe charging a flat platform fee in fiat or a native token to cover costs.

In terms of formal technical architecture, a possible tech stack could be: a web frontend (React or similar) connecting via APIs to a backend that interacts with blockchain nodes and databases (for off-chain data like user profiles, project documents, etc.). The blockchain itself could be Ethereum, but given sustainability ethos, perhaps a carbon-neutral chain (like one built on proof-of-stake or even a dedicated application sidechain specifically for SFT transactions to ensure minimal environmental footprint of the tech itself).

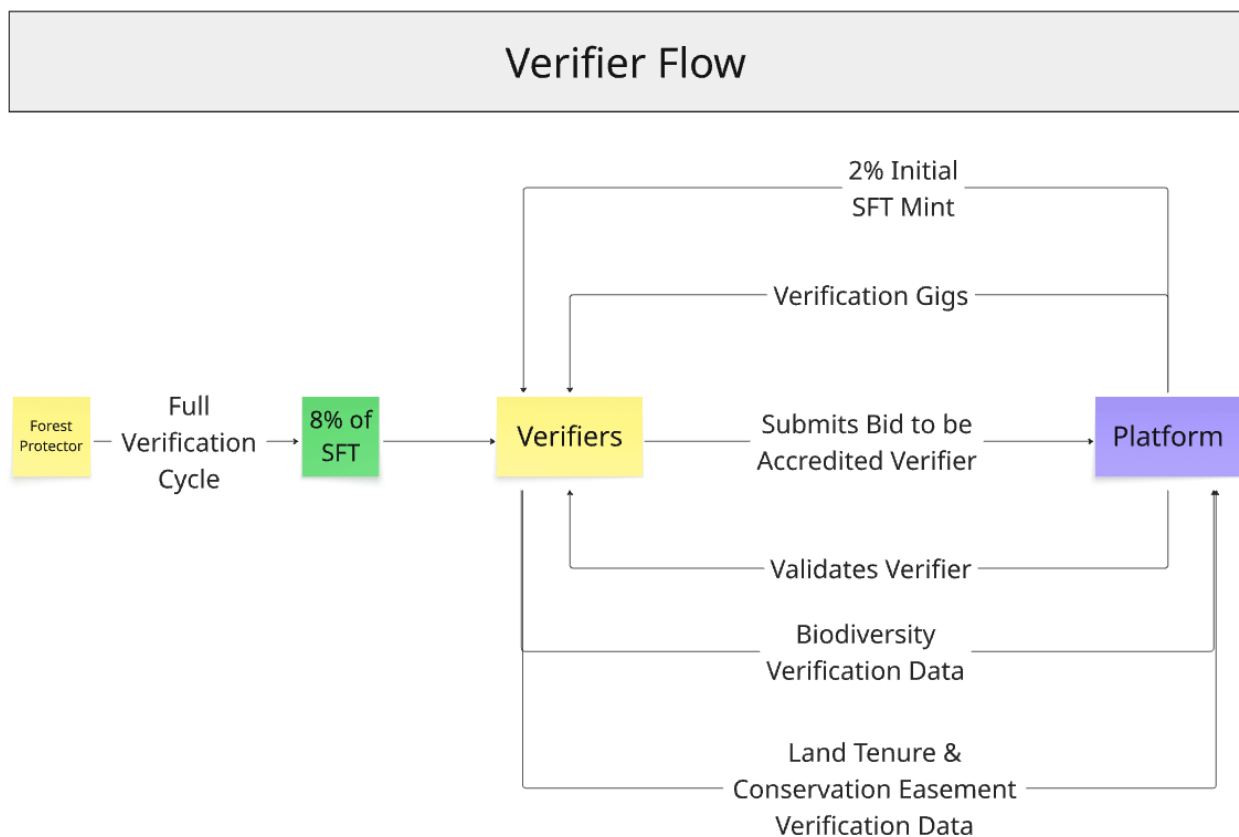
4.4 Stakeholder Roles & User Flow Diagrams

To clarify how different players interact with the architecture, here are the primary roles and their responsibilities:

- **Forest Protector / Project Developer:** Submits project for onboarding, provides necessary documentation, maintains the forest, possibly performs or facilitates data collection for verification, and in return receives SFTs, AVTs and ongoing support. They have a wallet to receive royalties and possibly hold some SFTs/AVTs. They communicate with verifiers to schedule annual checks.

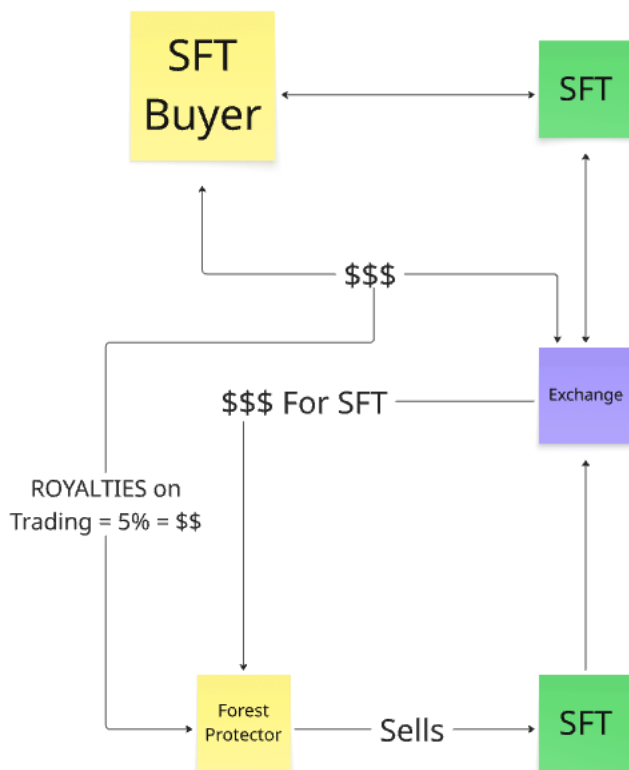


- Verifier / Monitoring Entity:** Could be a third-party company or NGO, or even a government body or a collective of citizen scientists, depending on context. They gather data on the project (field visits, satellite analysis) and produce a **verification report each year**. They input summary metrics into the platform (or provide them to the platform administrators/DAO) to trigger the AVT mint. They must be impartial and credible; the system may maintain a list of approved verifiers (governance can expand this list over time).



- **Investor:** Buys SFT for investment. They might interact purely through the market interface or via brokers. If they decide to exit, they sell their SFT to another investor at the new market price, but the forest protector doesn't lose - it just changes who its backer is.

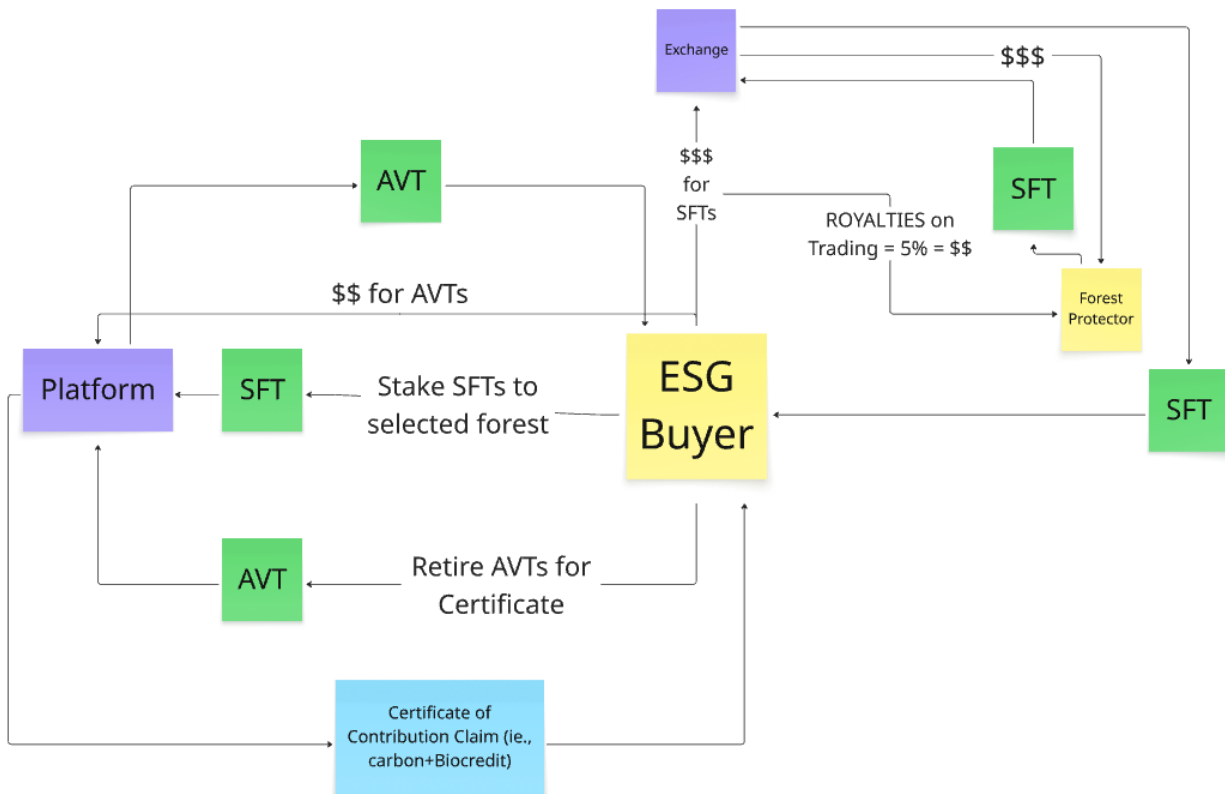
SFT Investor User Flow



This flow assumes investors are not interested in staking SFTs or purchasing AVTs for retirement purposes.

- Corporate ESG Buyer / Impact Investor:** Similar to conventional investors, but by staking their SFTs to selected forests, they effectively become a **long-term supporter** of a project, almost analogous to a shareholder who is aligned with the project's success (success here meaning continuous conservation). An important contrast is that in order to maintain a stake, investors must purchase annual AVT mints associated with the forest their SFT's are staked to. They can still decide to sell those AVT's on the secondary market (with a royalty going to the forest protector). Once bought, they can retire them for contribution claims. Their role ensures there is **demand for the AVTs** beyond just speculative, giving real economic value to the yearly tokens. In some cases, NGOs or governments interested in results-based finance might also act as AVT buyers (essentially paying for performance).

Impact Investor / ESG Buyer Flow



- **Platform Operator / Foundation:** Initially, a small team or entity will handle day-to-day operations: maintaining the site, customer support, liaising with verifiers and projects, marketing, etc. If decentralized governance takes over, some of these functions can be decentralized (like community volunteers for support, or automated systems), but likely a core team will still exist for some time. This operator ensures reliability and that any issues (technical or procedural) are fixed.
- **Governance Participants (DAO members):** Eventually, those who hold a governance token or SFT itself might vote on proposals. They ensure the system remains fair and efficient. They could be a mix of above roles – e.g., stewards might be given governance tokens to voice their perspective, and investors have their say proportionate to involvement, etc. The governance mechanism might even include external experts advising (like a council for science-based decisions, making sure methodologies remain rigorous).

By designing the architecture and governance with these roles in mind, The SFT Project aims for a platform that is **inclusive, transparent, and resilient**. Everyone's role is codified such that the **integrity of the token and what it represents is never compromised** – trust in SFT is ultimately based on trust that a token truly equals a hectare of protected high value tropical forest with verified outcomes. This trust is reinforced by technology (blockchain and remote sensing) and people (local stewards and verifiers), all orchestrated by the platform.

5. Comparison with Conventional Carbon and Biodiversity Markets

The SFT approach builds on lessons from existing carbon offset and emerging biodiversity credit markets while introducing key innovations. This section compares SFT/AVT to the conventional markets in terms of structure, incentives, and benefits, highlighting how SFT can complement but also improve upon those systems.

5.1 Conventional Carbon Credit Markets

Carbon credits (particularly in voluntary markets) are typically issued as tradable certificates representing one tonne of CO₂ reduced or removed. Projects (like reforestation or avoided deforestation) generate credits which companies or individuals buy to offset their emissions. This market has grown over the past decades but faces several well-documented challenges:

- *Quality and Integrity Issues:* The voluntary carbon market has been flooded with credits of varying quality. Many credits are criticized for not delivering real emissions reductions or for being difficult to verify. As one analysis notes, the market has had “a track record of supplying poor quality, cheap credits” which often do not channel adequate funds to the communities in the Global South who host those projects.
- *One-time Transactions:* In the standard model, once a carbon credit is sold (and possibly retired for an offset claim), the transaction is one-off. The project receives funding at that point, but future funding relies on generating and selling new credits. There is little guarantee of continuity or long-term support beyond the crediting period.
- *Fragmentation:* Carbon markets mainly price carbon; co-benefits like biodiversity are sometimes acknowledged (e.g., as “premium” credits) but not systematically monetized. Projects with high biodiversity value do not always get higher carbon prices sufficient to cover that extra value.
- *Speculation vs. Impact:* While credits can be banked or traded by speculators, the system is not primarily designed for secondary trading benefits to accrue to projects. The value

of a project's credits rising in the market doesn't directly send more money to that project (unless they withheld credits to sell later, which many cannot afford to do).

The SFT ecosystem addresses these issues in several ways:

- **Holistic Value (Carbon + Biodiversity):** By bundling carbon and biodiversity into AVTs, SFT ensures that projects with rich co-benefits get **rewarded holistically**, not just per ton of carbon. It broadens the market appeal beyond carbon-centric buyers to those interested in biodiversity, potentially accessing more funding sources.
- **Long-term Engagement:** The requirement that AVT retirement (for claiming offsets or contributions) can only be done by the SFT holder links credit use with **long-term project engagement**. A corporation that wants to offset emissions using SFTs would effectively need to invest in the underlying forest (buy and stake SFT) and then purchase annual AVTs to retire. This is a different narrative than buying a bunch of unrelated credits each year; it fosters a partnership-like model with specific forest areas. It helps overcome the “one-and-done” critique, making offsetting more like a continuous investment in protection.
- **Quality through Verification:** SFT's design inherently demands **annual verification** for AVT issuance. This means each hectare is monitored yearly (using satellites, drones, field surveys, etc.) to confirm its integrity and assess carbon/biodiversity metrics. This high frequency of verification, combined with transparent on-chain recording of AVTs, increases trust and quality. If a forest parcel fails to meet standards one year (e.g., some encroachment or degradation occurred), its AVT for that year might be reduced or withheld, providing immediate feedback and incentives to maintain quality.
- **Value Accrual to Stewards:** Unlike normal carbon credits where any secondary trading profit mostly benefits traders, in the SFT model **forest stewards benefit from market activity** via royalties (discussed in Section 4). This ensures that if SFTs appreciate in value due to market demand, a slice of that upside returns to those protecting the forest, not just early investors or middlemen. It attempts to correct the imbalance where Global

South project implementers often see little of the hefty prices that credits sometimes fetch on secondary markets.

- **Complementing Existing Crediting Systems:** The SFT platform is designed to work alongside and enhance existing conservation crediting mechanisms rather than replace them. Organizations like Savimbo, Regen Network, and other established bodies bring valuable expertise in measuring biodiversity, validating conservation outcomes, and working with local communities. The AVT structure can integrate credits and verifications from these systems, allowing their methodologies and data to feed into AVT issuance. For example, biodiversity assessments conducted by Savimbo or ecological data recorded on Regen Network's registry could serve as verification inputs for the biodiversity component of AVTs. This interoperability creates additional demand for existing credits and verification services, as SFT holders seeking AVT issuance would need to purchase or validate against these established standards. Rather than fragmenting the conservation finance ecosystem, this design allows proven methodologies to gain broader market access while benefiting from SFT's liquidity infrastructure and long-term engagement model. Existing credit holders could potentially convert or bundle their credits into AVTs, accessing the secondary market benefits and royalty mechanisms while maintaining the integrity of their original verification standards.

It's worth noting SFT **is interoperable and compatible** with carbon markets: the AVTs could be seen as a new format for bundles of eco-credits (encompassing both biodiversity and carbon). Companies needing to meet carbon neutrality can use AVT retirements similarly to carbon credit retirements. The difference is they are tied to long-term stewardship. However, if needed, AVTs could be unbundled – for example, a buyer could buy an AVT and choose to extract the carbon credit portion for an official offset registry and count the biodiversity portion as a separate claim. The platform will explore such interoperability so that SFT-ecosystem credits can plug into frameworks like the UNFCCC mechanisms or CORSIA for aviation if required.

5.2 Emerging Biodiversity Credit Markets

Biodiversity credits are a newer concept, aiming to create instruments similar to carbon credits but for biodiversity gains (such as habitat restored, species protected, etc.). They are still in pilot stages and lack standardized methodologies, although initiatives are growing especially after the global push from the **Kunming-Montreal Global Biodiversity Framework** which calls for innovative financing for biodiversity. In current practice, biodiversity credits often function as voluntary contributions rather than offset mechanisms (e.g., a company impacting habitat in one area supports conservation elsewhere to compensate). There are important differences from carbon:

- Biodiversity is **location-specific and non-fungible in many cases** (saving one species or habitat type cannot simply “replace” another), which makes standardization and trading more complex.
- The **value of biodiversity** is hard to price – often termed “priceless” – and there are ethical concerns about commodifying it.
- Early efforts in biodiversity credits emphasize **benefit-sharing and safeguards** to avoid doing harm (you can’t really “offset” species extinction in the way you offset a ton of CO₂).

SFT’s approach to biodiversity is to **integrate it with carbon** via the AVT, rather than create a separate standalone biodiversity credit for each project. This has a few advantages:

- **Stacked Incentives:** Project developers can pursue funding for biodiversity without having to enter a separate, nascent market. By protecting forests for SFT, they automatically generate biodiversity value that is recognized in the AVT. This could incentivize projects in areas of high biodiversity that might not have the highest carbon densities, thereby channeling money to where need is greatest.
- **Transparent Accounting via Blockchain:** All AVT issuances, transfers, and retirements are recorded on-chain with publicly auditable logs. This creates an immutable record that

prevents double counting, whether AVTs are used as bundled instruments or unbundled into separate carbon and biodiversity claims. Any entity can verify that a specific hectare-year's environmental contributions have been claimed only once, eliminating the opacity that has plagued traditional offset markets.

- **Market Efficiency through Standardization:** By establishing AVTs as a standardized unit that encompasses both carbon and biodiversity value, the SFT ecosystem reduces transaction costs and complexity for buyers. Rather than navigating two separate nascent markets with different verification standards and pricing mechanisms, buyers can access comprehensive environmental value through a single instrument that can be adapted to their specific needs (bundled or unbundled) while maintaining full traceability.

5.3 Interoperability and Differentiation

It's important to emphasize that the SFT is **not in competition with carbon or biodiversity markets** but rather complementary, aiming for **interoperability** while solving some of their shortcomings:

- SFTs use the **same underlying science and verification** as existing credits (meaning it doesn't create a parallel unverified system; everything is evidence-based and can be cross-checked by standards bodies).
- AVTs could be listed on carbon market registries (in theory) or at least recognized in corporate sustainability reports as equivalent to purchasing separate carbon and biodiversity credits.
- However, this ecosystem differentiates itself by packaging these credits with a **long-term asset (SFT)** that encourages ongoing support and **discourages the “buy, forget, and hope for the best” mentality**. The investor or corporate buyer becomes more like a patron of a specific forest area, with transparent updates.

In summary, relative to conventional markets, SFT offers:

- **Transparency** (blockchain records of issuances, trades, retirements, and automatic royalty tracking).
- **Longevity** (structured to support multi-decade conservation via continuous token issuance and stakeholder engagement).
- **Direct Stakeholder Benefit** (automatic distribution of value to stewards).
- **Holistic Impact** (carbon + biodiversity together).
- **Scarcity-driven value** (a limited supply asset)

By learning from the challenges of carbon markets and the aspirations of biodiversity finance, SFT aims to accelerate funding for forests in a way that is both ambitious and grounded in real-world metrics.

6. Literature Review and Related Work

The Standing Forest Token (SFT) concept emerges within a dynamic field of conservation finance, blockchain technology, and innovative economic models aimed at valuing nature. This review situates The SFT Project among related projects, highlighting its decentralized, self-organizing design that perpetually benefits forest protectors while enabling investor participation, and contrasts it with key initiatives like LandBanking Group's Nature Equity, Single.earth's MERIT token, Open Earth's Nature-Backed Central Bank Digital Currency (NB-CBDC), and InvestConservation's tokenized forest credits.

6.1 Financing Nature as an Asset

Traditional environmental finance has long grappled with how to make conservation pay for itself. A common theme in recent literature is treating **nature as a form of capital or infrastructure**. For instance, Dark Matter Labs' *Trees as Infrastructure (TreesAI)* initiative posits

that nature (in this case urban trees) should be considered critical infrastructure and financed accordingly. By developing platforms to value and invest in ecosystem services (e.g., the cooling or runoff reduction provided by trees), TreesAI has shown that connecting **environmental impacts with finance unlocks novel funding streams**. This supports the approach SFT takes: quantify the ecosystem services of forests and channel investment into them as you would for built infrastructure. SFT's model takes it a step further by enabling markets to recognize irreplaceable tropical forests as a store of value, beyond just its ecosystems services. Both TreesAI and SFT recognize that new institutional infrastructure (like decentralized digital platforms and dMRV) is required to mobilize capital at scale for nature.

The Landbanking Group's (TLG) Nature Equity framework, detailed in their 2024 consultation paper (Nature Equity Consultation Paper), introduces Nature Equity contracts as a new asset class to integrate nature into corporate balance sheets. These contracts ensure ongoing payments for conservation outcomes, equitable agreements between land protectors and investors, and value accrual as ecological value grows. SFT aligns with these principles by providing continuous payments to forest protectors via Annual Verification Tokens (AVTs) and royalties, creating a token-based link between protectors and investors, and offering SFTs that may appreciate with forest scarcity. However, SFT differentiates itself through its decentralized blockchain system, which enhances trust via transparent, tamper-proof records and ensures durability independent of centralized intermediaries. A key differentiating factor is that unlike Nature Equity, which may rely on traditional market infrastructures tied to carbon or biodiversity credit markets, SFT's success is not dependent on these markets, though it can integrate with them to maximize benefits for forest protectors.

6.2 Nature-Based Currencies and Monetary Innovation

Another stream of innovation reimagines currency systems to embed nature's value. The Open Earth Foundation's whitepaper on Nature-Based Currencies (NBC) (Open Earth Foundation - Nature Based Currencies) proposes a Nature-Backed Central Bank Digital Currency (NB-CBDC), a thought experiment where central banks issue digital currencies backed by ecological assets to

promote conservation and address global inequities. SFT shares this vision of shifting economic value from extractive to regenerative assets, aligning with NBC's goal of avoiding ecological collapse and promoting geopolitical equity. However, SFT diverges by operating as a decentralized token system outside central bank jurisdictions, leveraging blockchain for transparency and scientific verification of forest health to ensure trust. This independence allows SFT to be more accessible and resilient, avoiding reliance on governmental oversight. This independence also allows for the SFT to be positioned as a global currency, transcending political borders in favor of a common understanding that irreplaceable tropical forests provide a planetary value to us all.

Single.Earth's MERIT token was an attempt to create a nature-backed digital asset that rewarded landowners for preserving ecosystems such as forests. Operated by a for-profit company based in Estonia, the MERIT token was marketed as a tool for monetizing the ecological value of land, with tokens minted based on in-house ecosystem models. Despite raising \$7.9 million in early-stage funding, the project faced several fundamental challenges that limited its effectiveness and long-term viability.

One major limitation of MERIT is the **centralized nature of its minting process**. Token issuance was determined internally by Single.Earth, using proprietary models with limited transparency, and without rigorous third-party validation or compatibility with existing MRV frameworks. The token's **valuation was ultimately tied to assumptions about carbon market pricing**, which introduced volatility and constrained its usefulness in broader biodiversity or conservation finance contexts.

MERIT also lacked integration with established environmental credit markets and did not clearly distinguish between the long-term asset value of forest conservation and the measurable annual outcomes that could support claims or returns. As a result, the token struggled to gain traction among institutional buyers, regulators, and the broader conservation community. With limited trading availability, few if any verified outcomes published, and no substantial ecosystem integrations, MERIT has seen minimal market activity as of 2025. Single.Earth was also designed primarily for the European context, focusing on temperate and managed ecosystems, and does

not incorporate the ecological scarcity or irreplaceability of primary tropical forests into its valuation model.

The SFT project addresses these issues through a structured dual-token system that separates a **non-carbon-linked conservation asset** (the SFT, representing one verified hectare of forest) from an **Annual Verification Token (AVT)** that bundles carbon and biodiversity credits, based on externally verified data and methodologies aligned with leading standards.

Unlike MERIT's centralized value chain, SFTs are minted only after land tenure and ecological integrity are verified, with minting triggered transparently and tracked on-chain. The SFT ecosystem is designed to evolve into a decentralized governance structure, with token issuance, royalty flows, and verification rules governed by smart contracts and community oversight.

While MERIT aimed to abstract value from ecosystem preservation without engaging the credit market in a structured way, the SFT ecosystem integrates with the carbon and biodiversity credit systems where appropriate. The AVT is designed to interoperate with credit registries but can also function independently for ESG impact reporting and other performance-based finance use cases.

In summary, the MERIT token's centralized minting process, opaque valuation model, and reliance on internal assumptions limited its ability to scale or build trust. The SFT model responds to these limitations by embedding transparent verification, separation of asset and yield, and compatibility with global markets to create a more credible and versatile approach to digital conservation finance.

6.3 Market Mechanisms and Risks – Lessons Learned

InvestConservation's project (InvestConservation) also tokenizes tropical forests, with each IC-Token representing 50 years of carbon and biodiversity rights of one hectare of tropical forest. This approach also relies on the success of carbon and biodiversity credit trading to deliver value and limits the autonomy of forest protectors by selling 50 years' worth of their

credits upfront. In contrast, SFT's design is not contingent on credit market performance; SFTs represent the intrinsic value of protected forest hectares, with AVTs providing annual verification of ecosystem services. This structure allows forest protectors to benefit from the forest's inherent value and potential credit market gains without dependency, offering a more resilient and equitable model.

The Standing Forest Token Project also addresses critical risks highlighted in conservation finance literature. Carbon market critiques, such as issues of additionality, permanence, and leakage, are mitigated through SFT's rigorous annual verification and capped supply model, ensuring transparency and accountability. Additionally, SFT incorporates lessons from decades of community based conservation work with an emphasis on Indigenous and local community rights, ensuring fair benefit-sharing and co-design with stakeholders to avoid conflicts or "land grab" scenarios. By hard-coding systems that enable funds to flow directly to a Forest Protector Fund, automatically distributed to forest protector wallets, SFT eliminates centralized profit-seeking tendencies present in some for-profit projects, fostering a self-organizing system that can scale globally. A key differentiating factor is that the value derived from conservation, whether the forest's inherent value or the carbon/biodiversity credit value, is not amassed by any centralized entity, and then redistributed, but rather funneled directly to forest protectors and the key actors needed to maintain trust in the system (e.g., verifiers).

Another historical attempt is the **Standing Forest Coin (SFC)** proposed by Brazilian researchers for the Amazon. SFC was envisioned as a digital currency to fund Amazon conservation also through blockchain and smart contracts. It was essentially a very early concept of a forest-backed cryptocurrency aimed at directing money to forest protection initiatives. While SFC did not gain widespread traction, it's notable that the idea of a "coin" for standing forests has been percolating. A key differentiating factor was that the SFC project proposed an ICO, or Initial Coin Offering, and therefore would centrally control supply, whereas SFTs would only be minted by verified forest protectors. SFT can be seen as a more refined evolution, incorporating

the lessons from SFC's proposal (such as the need for clear verification and integration with existing market mechanisms).

Beyond specific projects, there's growing literature on **"ReFi" (Regenerative Finance)** in the blockchain space, which SFT is a part of. ReFi projects seek to leverage decentralized finance for climate and ecological outcomes, e.g., platforms like Regen Network or Toucan have tokenized carbon credits on-chain. SFT distinguishes itself by tokenizing the underlying asset (tropical forest hectare) and combining multiple outcomes, whereas many ReFi efforts so far have focused on improving carbon credit trading (e.g., creating liquidity pools for carbon credits). That said, SFT could collaborate with or utilize infrastructure from these – for example, using Regen Network's registry to host and transact AVTs and retirements.

While there is growing momentum in this space, some academics caution against over-financializing nature (creating too many complex instruments could lead to speculation detached from ecological reality). SFT tries to balance this by tying token issuance to real verification and capping supply. Literature on **environmental derivatives** and past schemes (like catastrophe bonds, habitat banking) indicates that transparency and simplicity help avoid unintended negative outcomes. **We thus cite that SFT's structure, though involving blockchain, strives for clarity (one token = one hectare, one AVT = one year of service on that hectare) which stakeholders can understand, rather than opaque derivatives.**

In conclusion, the literature and related efforts form a supportive backdrop for SFT, indicating that:

- The world is searching for new financial paradigms that integrate nature's value (from Nature Equity to NBC to ReFi).
- Technological tools (like blockchain and remote sensing) are increasingly seen as enablers for these paradigms, albeit with the need for careful design.
- Several pilot projects (Single.Earth, etc.) have proven the appetite for nature-backed assets.

- Thinkers across disciplines (economics, environmental science, indigenous rights, fintech) are converging on the idea that **keeping ecosystems intact can and should be directly profitable**. SFT’s dual-token model is a novel contribution to this movement, attempting to operationalize it at scale.

SFT builds on the shoulders of pioneering projects while addressing their gaps. It aligns with TreesAI and Nature Equity in valuing nature as an asset but leverages blockchain for decentralization and trust. It shares Open Earth’s vision of nature-backed economic systems but operates independently of central banks, ensuring accessibility, scalability and scientific credibility. Learning from Single.earth’s challenges, SFT emphasizes structured verification and market integration. Unlike InvestConservation’s credit-dependent model, SFT’s success is rooted in the intrinsic value of protected forests, with optional credit market integration. This decentralized, self-organizing approach positions SFT as a novel contribution to conservation finance, balancing perpetual benefits for forest protectors with opportunities for investors in a nature-positive economy.

Project	Key Mechanism	Dependency on Credit Markets	Decentralization	Verification
SFT	Dual-token (SFT for hectares, AVT for services)	Not dependent, but integrates	Decentralized via blockchain	Rigorous annual scientific verification
LandBanking Group (Nature Equity)	Contracts for nature outcomes	Potentially tied to credits	Likely centralized market infrastructure	Outcome-based MRV
Single.earth (MERIT)	Tokens for ecosystem preservation	Unclear, likely credit-related	Blockchain-based, but traction limited	Limited verification details
Open Earth (NB-CBDC)	Central bank digital currency	Not applicable (conceptual)	Centralized (central bank)	Conceptual, not implemented
InvestConservation	Tokens for carbon/biodiversity rights	Dependent on credit markets	Unclear, likely centralized	Satellite auditing

The rest of this white paper will build on these insights to discuss risk management and the practical steps to implement SFT moving forward.

7. Risk Analysis

Like any bold innovation, the Standing Forest Token model comes with a set of risks and challenges that must be managed. This section analyzes the primary categories of risk – environmental, financial, technological, social, and regulatory – and discusses mitigation strategies for each.

7.1 Environmental and Verification Risks

Non-Performance Risk: The biggest environmental risk is that a forest enrolled in the SFT program might not remain standing or might not deliver the anticipated carbon/biodiversity benefits. This could happen due to illegal encroachment, natural disasters (fire, storm), or project mismanagement. If a forest is degraded or lost, the value backing its SFT and future AVTs is compromised.

Mitigation:

- Rigorous initial vetting of projects to ensure they have low deforestation risk (e.g., community buy-in, not in a war zone, etc.).
- Insurance or buffer mechanisms: perhaps holding back a percentage of AVTs in a **buffer pool** (like carbon market buffers) to cover unexpected losses by averaging out risk.
- Diversification: Since SFT will eventually encompass many projects, risk is spread. An investor can also hold a portfolio of SFTs from different regions to hedge against any single project failure.
- Continuous monitoring: The annual (or even more frequent) satellite checks will catch issues early. If a problem is detected (say a parcel is deforested), the system can respond

(stop issuing tokens, alert stakeholders to intervene on the ground). The transparency means problems won't be hidden, which is a good thing in the long run for trust, even if it reveals setbacks.

- Potential for a crisis fund to support regeneration activities upon verification of natural disaster.

Accuracy of MRV: There's a risk that measuring carbon and biodiversity is complex, and errors or disputes could arise. If AVTs are over-issued due to overestimation of carbon, that undermines integrity.

Mitigation:

- Use of **best-in-class methodologies** and independent third-party audits for key metrics. Possibly incorporate multiple data sources (community reports, scientific reviews) to corroborate automated data.
- Conservative accounting: lean toward underestimating than overestimating credits to maintain a cushion.
- Over time, improvements in tech (e.g., better satellite resolution, AI ecology models) can be integrated via governance to continuously improve accuracy.

Double Counting: Ensuring that a given forest's outcomes aren't sold twice (e.g., a project shouldn't sell regular carbon credits outside SFT ecosystem and also issue AVTs for the same ton). This is addressed by **integration and transparency** – projects in the SFT ecosystem likely will choose to funnel all their credits through AVTs. If they do partial, it must be clearly documented and perhaps limited. Blockchain's traceability helps; each AVT is unique and when retired, it's accounted for. We may also integrate with global carbon registries (e.g., marking that those credits are retired in an external registry when an AVT is retired, to avoid any separate claims).

7.2 Financial and Market Risks

Price Volatility: As a token traded on markets, SFT's price could be volatile, influenced by crypto market swings or speculative cycles. Large price drops could hurt protectors who still hold some tokens or discourage new investors; large spikes could encourage speculation divorced from fundamentals.

Mitigation:

- Building a base of **long-term oriented holders** (like impact funds, corporates) to provide price stability. If much of the supply is in strong hands, volatility from traders is dampened.
- Possibly implementing circuit-breakers or gradual unlocks (e.g., if a project's tokens are to be sold, do it gradually or through an OTC deal with a mission-aligned buyer, rather than dumping on an exchange).
- Selling directly to buyers interested in staking, further limiting supply while ensuring recurring AVT revenue for the Forest Protector.
- Providing clear value signals: The SFT model promotes price stability by linking token value to verified ecological outcomes, with AVTs representing annual carbon and biodiversity credits for specific forests, priced by market demand for these credits. SFT holders who stake their tokens to a particular forest project must purchase associated AVTs to maintain their stake, creating a direct connection between investment and ongoing conservation performance. This requirement allows staked SFT holders to estimate a fundamental value based on the cost and frequency of AVT purchases, akin to a recurring investment commitment. Investors who choose not to stake SFTs can hold or trade them, benefiting from potential price appreciation driven by the capped SFT supply and growing demand for nature-backed assets, though they forgo access to AVTs. For staked SFTs, if prices fall too low, the relative cost of AVTs becomes more attractive, encouraging buying and staking to secure high-value ecological outcomes; if prices rise too high, the cost of maintaining stakes through AVT purchases may deter speculative overbuying, prompting sales. For un-staked SFTs, low prices attract buyers anticipating

future appreciation, while high prices encourage profit-taking. This dual dynamic helps the market find a rational equilibrium, anchoring SFT value to the tangible ecological contributions of protected forests, unlike many crypto assets with no intrinsic performance linkage.

Liquidity Risk: In early stages, there may be limited buyers for SFT or AVT. If a steward tries to sell tokens but cannot find buyers at a fair price, the funding model falters.

Mitigation:

- **Staged scaling:** Starting with pilot projects and perhaps pre-arranged buyers (e.g., partnering with an NGO or impact investor to guarantee purchase of initial tokens) can ensure liquidity at start.
- **Market making:** the platform or partners could act as market makers to provide buy/sell orders and reduce spreads.
- **Encourage exchange listings and DeFi integrations** (like liquidity pools) to tap into broader crypto liquidity, while carefully monitoring to avoid excessive speculation.

Fraud and Security: Financially, there is risk of fraud – e.g., someone might try to enroll a forest they don't actually control (land tenure fraud) to get tokens, or hackers might target the token contracts.

Mitigation:

- **Strict due diligence** on project proponents, including on-ground checks for land tenure (perhaps involving local authorities or certification of titles).
- **Smart contract audits and bug bounties** to minimize hacks. Also, multi-sig keys for any admin functions to prevent single-point breaches.
- **In case of a proven fraud** (e.g., a project was a scam), governance could revoke tokens or label them as unverified, to protect buyers. This would be a drastic measure but necessary to maintain trust in the system.

Macro-economic Factors: If carbon markets crash or climate policy shifts (for instance, if global carbon price falls or rises sharply), it could affect demand for SFT/AVT. Also currency fluctuations in countries where protectors live might affect their behavior (they might sell more tokens at once if local currency devalues, etc.). These are hard to mitigate directly, but SFT's global nature means it can adapt by reaching buyers in various markets. Also, **diversifying revenue** (SFT has both capital value and yearly credit value) provides some resilience: even if carbon credit prices drop, the SFT still has the intrinsic scarcity value; if token market cools, the credits still have value to buyers, providing baseline demand.

7.3 Technological Risks

Blockchain/Platform Risk: The choice of blockchain could pose risks – congestion, high fees, or even chain failure. Ethereum, for example, has periods of high gas costs; if that coincided with needing to issue thousands of AVTs, it could be problematic.

Mitigation:

- Possibly use a Layer-2 scaling solution or an application-specific sidechain for the heavy minting tasks, while anchoring key data to Ethereum mainnet for security. This way, day-to-day operations are cheap and fast, but ultimate records are secure.
- Design contracts efficiently to minimize gas (e.g., using batch operations, keeping most data off-chain).
- In worst case, have a contingency to migrate to a different chain (some projects built migration functions if the underlying chain became untenable).

Data Integrity: Relying on satellite or external data means trusting oracles. Oracle failure or manipulation is a risk (if someone hacks the oracle to say a forest is fine when it's not, or technical glitch misses a change).

Mitigation:

- Use multiple independent data sources. For example, two different deforestation alert systems plus human reconfirmation for important decisions.

- Oracles can be decentralized to some extent: perhaps verifiers stake some collateral and if their data is proven false later, they lose it (this aligns incentives for honesty).
- Keep human-in-the-loop: technology aids, but critical calls (like certifying the yearly AVT issuance) should have expert oversight.

User Error and Support: As with any blockchain app, users might lose private keys or send tokens to wrong addresses. Given these represent real livelihoods, that's a risk. Some local protectors might not be technically savvy.

Mitigation:

- Provide custodial options or community custody (e.g., a community keeps a hardware wallet managed by multiple trusted members).
- Education and perhaps insurance – maybe the platform or a partner can insure a limited amount of tokens against user mistakes or theft.
- Have robust customer support to assist with common issues (password recovery for hosted accounts, etc.).

7.4 Social and Ethical Risks

Community Conflict: Introducing tokens and payments into communities can create internal conflicts or power imbalances. For example, who in a community gets the tokens? Is it the leader, the community fund, individual households? If not handled well, it could cause disputes or elite capture of benefits.

Mitigation:

- Insist on a community governance plan during onboarding: the project should outline how proceeds will be shared or invested. Encourage community funds or equal splits as appropriate. Some projects may use the tokens to fund schools, health clinics, etc., instead of direct cash – those decisions should be community-led.

- Work with reputable local intermediaries (NGOs, cooperatives) to facilitate fair benefit-sharing. They can help design and monitor that the money reaches the right places.
- FPIC: Ensure that the community truly consents and is not coerced by an outside party to join the platform. Documentation of community consent and understanding should be part of onboarding.

Land Tenure Risks: The introduction of SFTs could exacerbate land tenure disputes, particularly in regions with contested or unclear land rights, forcing indigenous communities and local stewards—who have protected forests for generations—to have to fight harder to secure or maintain legal tenure. Authoritarian governments may attempt to expropriate land from historical stewards to capture SFT benefits, while profit-seeking actors could centralize forest ownership by purchasing or claiming land, especially where ownership rights do not directly translate to legal tenure. Communities lacking technological savvy or awareness of SFT opportunities risk being outmaneuvered by opportunistic buyers or state actors, further marginalizing those who have historically protected forests without monetary compensation.

Mitigation:

- **Prioritize Historical Stewardship:** Require proof of historical forest protection (e.g., satellite imagery, community testimonies, or third-party records) as a condition for minting SFTs on contested land. This ensures that communities with long-standing stewardship are prioritized for token issuance and legal tenure support.
- **Exclude Ineligible Entities:** Automatically disqualify entities associated with land-grabs, land trafficking, extractive industries (e.g., logging, mining), or community exploitation from minting SFTs. A vetting process, supported by independent auditors and local NGOs, will screen applicants to ensure only high-integrity stewards, such as indigenous communities and reputable conservation organizations, participate.
- **Strengthen Legal Tenure:** Partner with legal aid organizations and land rights advocates to provide pro bono support for communities and conservation organizations seeking formal

land titles before onboarding. SFT projects will include a mandatory land tenure assessment, ensuring clear or actively pursued legal rights, with funds from initial SFT sales allocated to resolve disputes in favor of stewards.

- **Community-Led Governance:** Mandate that projects on contested land establish community-led governance structures, approved through Free, Prior, and Informed Consent (FPIC), to manage token proceeds and land rights decisions. This empowers communities to control their assets and defend against external claims.
- **Transparency and Monitoring:** Use blockchain to publicly record land tenure agreements and SFT minting details, allowing global scrutiny to deter fraudulent claims. Regular audits by independent bodies, including indigenous rights organizations, will monitor tenure disputes and ensure compliance with eligibility criteria.
- **Tenure Dispute Resolution Fund:** Establish a fund, financed by a portion of SFT royalties (0.5% of the 2–5% per trade), to support communities in legal battles against illegitimate claims, ensuring financial resilience for stewards facing tenure challenges.
- **Anti-Expropriation Safeguards:** Implement a strict policy prohibiting SFT minting on land subject to recent (within 10 years) or ongoing government expropriation, verified through international human rights organizations and local advocacy groups. Projects in authoritarian contexts must demonstrate FPIC and third-party validation of tenure legitimacy to prevent state-led land grabs.
- **Recognition of Customary Tenure:** Allow SFT minting for communities with customary but non-legal tenure, provided they demonstrate historical stewardship and engage in a supported legal recognition process. A dedicated SFT tenure taskforce, including indigenous legal experts, will develop region-specific guidelines to bridge customary and legal tenure systems, ensuring fairness where formal titles are absent.
- **Outreach and Capacity Building:** Launch a multilingual, community-focused outreach program, partnering with local NGOs and indigenous networks to raise awareness of SFT opportunities. Provide accessible, low-tech onboarding tools (e.g., paper-based FPIC processes) and train community leaders in onboarding basics to ensure non-tech-savvy stewards can participate without intermediaries.

- **Anti-Centralization Measures:** Cap the number of SFTs any single entity can mint (e.g., 5% of total supply) to prevent profit-seeking actors from consolidating forest ownership. Priority access to SFT minting will be given to communities and conservation organizations.
- **Ease of Access to Good Actors:** Whitelist high-integrity stewards to enable positive land acquisition of at-risk forest. Land tenure safeguards should protect against community exploitation, but not be prohibitive from reputable conservation organizations acquiring land to expand ecological conservation corridors.
- **Early Warning System:** Establish a blockchain-based monitoring system, integrated with global land rights databases (e.g., LandMark), to flag suspicious land purchases or tenure changes in SFT-eligible regions. Alerts will trigger immediate audits and pause minting until community or steward rights are verified, protecting against opportunistic land acquisitions.

Cultural values: Some communities might object to “tokenizing” nature from a philosophical view (e.g., considering it a spiritual entity not a financial asset). This must be respected. SFT is voluntary; it’s not imposed on anyone.

Mitigation:

- Provide alternative framing: instead of “selling nature”, frame it as “receiving support for stewardship” which many find more acceptable.
- If some groups prefer direct grants or other models, SFT can coexist with those – it’s not a one-size solution. The risk is more that hype could overshadow other needed funding mechanisms. We mitigate by acknowledging SFT is one tool in a toolbox.

Market Demand and Perception: If, due to some incident, SFT were perceived as “greenwashing” or a failed scheme (e.g., imagine a scandal where a project took money but allowed logging secretly), it could damage the reputation of nature tokens broadly. Public opinion might turn against such mechanisms.

Mitigation:

- Transparency is the best defense – issues will be visible, and the platform should be candid about both successes and failures.

- Engage independent watchdogs or observers. Perhaps partner with an organization or coalition to periodically audit the whole portfolio and publish reports. External validation can maintain credibility.
- Gradual scale-up with success stories: prove the model with a few strong projects and real impact (reduced deforestation, improved livelihoods) before scaling broadly, so there's a foundation of trust.

7.5 Regulatory and Legal Risks

Securities Regulation: Regulators might view SFT as a security (an investment contract) or the entire scheme as an unregistered offering if not careful. Laws vary by country, but this risk is real given tokens are subject to the Howey test in the U.S., for example.

Mitigation:

- Structure SFT with legal counsel input. Possibly position it as a **utility or asset token** rather than a speculative security. Highlight its environmental purpose.
- Engage with regulators early, perhaps seek sandbox approvals. If necessary, restrict sales in certain jurisdictions or require accredited investors for initial phases, until clarity improves.
- Alternatively, some have suggested tying tokens to tangible assets can sometimes be treated differently. If SFT is akin to a carbon credit (which regulators often treat as commodities or sui generis assets), not purely a profit-share, that might help.
- The platform might need KYC (know-your-customer) processes for participants to prevent issues like money laundering or sanctions violations, especially as real money flows to remote areas. Complying with such rules can prevent future legal issues.

Land Tenure Law: By monetizing ecosystem services, are we creating any legal claim on the land? We must ensure that buying an SFT **does not confer property rights** over the land nor does it confer a claim on environmental services. Buying an SFT does not entitle you to a carbon or biodiversity credit; rather it allows you to purchase those credits transparently and tangibly

participate in the survival of the last billion hectares of tropical primary forest. This needs to be clear to avoid misunderstandings. Contracts with protectors and the token T&Cs should spell this out: land is not being sold, and owning an SFT does not represent an offset. AVTs however, interact in the market, and legislation, very similarly to carbon and biodiversity credits. Or where carbon is over-regulated, only biodiversity credits. This is especially important to distinguish with regards to regional laws, as some countries might require specific agreements or permits for benefit-sharing agreements under their environmental laws. We'd work country-by-country to comply and perhaps partner with government programs to avoid conflict (for example, if a government has its own carbon credit program, coordinate to avoid double issuance).

Taxation: The gains from selling tokens might be taxable income for communities (which could be complicated). Also, companies retiring AVTs might want to count them for compliance markets, which have their own rules.

Mitigation:

- Provide guidance to participants on potential tax implications.
- Explore recognizing AVTs under carbon tax or offset laws – this might be a later stage when lobbying for recognition in compliance markets.

In summary, the risk analysis shows a wide array of challenges, but none are insurmountable. By anticipating these risks, SFT's implementation can incorporate safeguards: blending technological solutions, prudent financial design, community engagement frameworks, and legal compliance measures. The goal is to ensure that the SFT system is resilient, credible, and beneficial to those it's meant to serve (the forests and their protectors), even under adverse scenarios.

8. Implementation Roadmap & Project Updates

Translating the SFT vision into reality requires a phased approach. Below is a roadmap outlining the key milestones and phases, from initial development to full-scale deployment and growth. This roadmap is tentative and will be refined as the project progresses and learns from each stage.

Phase 0: Research and Concept Validation (Q1–Q2 2025)

- **White Paper and Feedback:** Complete the SFT white paper (this document) and circulate it among experts, potential partners (conservation NGOs, systems change think tanks, blockchain developers, policy advisors) for feedback and endorsements. Incorporate input to refine the model.
- **Feasibility Studies:** Conduct in-depth studies on target regions for pilot projects (e.g., Ecuadorian Andean Chocó, Amazon basin, Indonesian Borneo, etc.). Identify candidate forest sites and engage with local stakeholders to gauge interest. Validate that land tenure situations, community dynamics, and local legal frameworks can support an SFT pilot.
- **Partnerships:** Secure preliminary partnerships:
 - With a satellite monitoring provider (to support the dMRV component).
 - With a blockchain development team or firm to build the smart contracts and platform.
 - With at least one verification organization and one conservation NGO to act as collaborators on the pilot (ensuring real-world grounding).
- **Prototype Design:** Outline the technical architecture in detail and start drafting smart contract code for SFT and AVT. Possibly run simulations of the token economics with hypothetical data to see outcomes (stress-test scenarios of token distribution, price, etc. on paper).

Phase 0 Update - May, 2025:

- Small grant funding from Rainforest Trust to the Maquipucuna Foundation for whitepaper finalization and development of communication strategy.
- Maquipucuna Foundation dedicated additional in-kind support for the development of this whitepaper and the establishment of the **Biodiversity Finance Innovation Alliance (BioFIA)**.
- The 1st SFT White Paper draft is ready for review.
- In talks with the Ecuadorian National Network of Forests (Red de Bosques de Ecuador) to join as pilot forest protector users.

Phase 1: Fundraising & Pilot Launch (Q3 2025 – Q2 2026)

- **Pilot Project Onboarding:** Select a small number (perhaps 20-30) of forest sites for the pilot, totaling maybe a few hundred thousand hectares. These should be in different contexts (for example, some indigenous community reserves, some private conservation areas, some government-backed park co-managed with locals) to test the model's versatility. Sign MOUs with the protectors of these forests outlining the terms (including community benefit plans, data sharing agreements, etc.).
- **Token Minting (Initial):** For each pilot project, perform the Phase 1 verification (land tenure check and baseline desk assessment). Mint the first tranche (~30%) of SFTs for each. Instead of immediately throwing them on public markets, initially perhaps distribute them via a **private sale or auction** to invited impact investors or partner organizations. This ensures a controlled environment and fair pricing. The funds raised go to the protectors per agreements.
- **Platform MVP:** Launch a minimal viable product of the platform:
 - Basic web interface showing the pilot projects, tokens, and allowing transactions (maybe integration with a test network first, then mainnet).
 - Wallets set up for protectors.
 - A simple block explorer or dashboard for transparency.

- **Community Engagement:** Throughout the pilot, heavily involve the communities. Provide training on using the platform, managing tokens, etc. Address any local issues.
- **Full Verification and AVT Issuance:** Within this phase, complete the full on-site verification for pilot projects (Phase 2 minting). Mint the remaining SFTs and the first year's AVTs for these projects. This will be the moment of truth to demonstrate the flow: protectors now have more tokens (which they can sell or hold), and annual credits available. Facilitate a **retirement ceremony** or PR event where maybe a corporate partner retires the first AVTs, to showcase the concept to the world.
- **Monitoring & Evaluation:** Document everything: how much funding delivered, what community feedback, any tech issues, forest status changes. This will inform adjustments. Possibly publish a pilot report.

Phase 2: Iteration and Scaling Basics (Late 2026 – 2027)

- **Refinement:** Based on pilot results, refine smart contracts (upgrade if needed), platform features, and perhaps the economic parameters (e.g., was 30/70 split fine? Is royalty % okay? Adjust if necessary through governance or contract updates).
- **Legal Structuring:** By now, likely incorporate a foundation or legal entity for SFT if not already. Use pilot credibility to engage with regulators, ensuring the next phase is compliant. Possibly get an innovative finance label or government endorsement in one country.
- **Expand Project Onboarding:** Open up a second cohort of forest projects. Aim for maybe 100-200 projects, a mix of geographies. This might include some more tropical countries and diverse ecosystems. Develop a **standardized onboarding toolkit** so new projects can apply. Possibly integrate a community voting or expert committee to approve these projects.
- **Technology Upgrade:** Develop more advanced features on the platform:
 - A more robust marketplace for tokens (maybe allow peer-to-peer listings).
 - Integration with popular crypto wallets.
 - Enhanced map and data visualizations.

- Multi-language support.
- **Community of Practice:** Create a network or forum for all participating protectors to share experiences. Also engage a wider community by maybe launching a “SFT Alliance” where interested organizations can join to support (could include universities, research orgs to help with MRV, etc.).
- **Secondary Market Liquidity:** By 2027, list SFT on at least one reputable exchange or decentralized exchange pairing (like SFT/USDC pool) to foster liquidity. Ensure that initial token holders (protectors) are educated about market dynamics to avoid panic selling. Possibly implement a treasury that can buy back some tokens if price crashes (to stabilize).
- **Governance Trials:** Experiment with participatory decision-making. Maybe form a pilot DAO with representatives from projects and some token holders to decide on a small matter (like selecting a logo or funding a community project with some treasury funds) – basically to test governance processes in a low-stakes way.

Phase 3: Growth and Network Effects (2028–2030)

- **Global Scaling:** Aim to onboard hundreds of projects, potentially covering millions of hectares. By 2030, the goal might be, say, 50-100 million SFTs issued (i.e., hectares protected via SFT). This will require ramping up operations:
 - Regional hubs or partnerships to source and manage projects (maybe partner with entities like Amazon Fund in Brazil, or national parks in Africa, etc.).
 - Streamlined verification – possibly training local auditors or using more automated remote sensing to handle scale.
- **Interoperability:** By this stage, push for integrating SFT/AVT with international frameworks:
 - Work to get AVTs (or the methodology) recognized under Article 6 of the Paris Agreement (so countries could potentially use them in emissions accounting).
 - Collaborate with the Taskforce on Nature Markets or other global coalitions to position SFT as a leading example of nature market innovation.

- If Central Bank Digital Currencies (CBDCs) with nature backing are being explored in certain countries (inspired by OpenEarth's work), ensure SFT can connect or inform those (e.g., a country might use SFT platform data to issue a sovereign nature bond).
- **Ecosystem Development:** Encourage third-party services around SFT:
 - Perhaps insurance products (someone could insure an SFT holder against forest loss).
 - Analytical services (ratings for projects' biodiversity value, etc., analogous to credit ratings).
 - Integration into carbon accounting software for companies (so it's easy for a company to plug their SFT holdings into their ESG reports).
- **Strengthen Governance:** Transition more decision-making to a formal DAO. Possibly introduce a governance token (if SFT itself is not used for voting to avoid conflicting interests) that is distributed among active participants. By 2030, the community could be largely self-governing, with the founding team stepping back to a facilitation role.
- **Marketing and Awareness:** Large-scale campaigns, possibly aligned with big events (UN climate COPs, biodiversity summits) to demonstrate the impact. By accumulating years of data, we can show: X hectares protected, Y tons CO₂ sequestered, Z species habitats preserved, \$\$ delivered to communities, etc. This storytelling will help bring more supporters and possibly policy support.

Phase 4: Maturity and Integration (2030 onward)

- **Full Market Integration:** SFTs become a mature instrument. We might see banks, institutional investors holding it as part of green portfolios. Perhaps even integration into **national or corporate accounting** (e.g., a corporation lists SFT holdings as part of its assets akin to renewable energy certificates).

- **Adaptive Management:** The system would continue evolving via governance. For instance, if new technologies allow biodiversity to be measured much better (e.g., genetic assays from eDNA), the community may incorporate that. New token types could be introduced if needed (maybe a water service token or so, though ideally, SFT/AVT covers enough).
- **Impact Monitoring:** Commission longitudinal studies to assess the real-world impact: Are deforestation rates reduced in SFT areas? Are communities better off financially and socially? Use these findings to improve the mechanism or showcase success to replicate in other contexts (like other ecosystems beyond tropical forests – e.g., could do mangrove tokens, etc. under similar principles).
- **Risk Mitigation Funds:** By now, likely a sizable “rainy day” fund or pool exists (from small fees or token reserves) to handle any large-scale issues (like a major project loss due to unforeseen reasons). This ensures confidence that even if some local failures happen, the overall system compensates and endures.

The roadmap above is ambitious, but each step builds logically on the previous. By starting small, proving the concept, then scaling up while institutionalizing good practices, the SFT project can gradually transform from a novel experiment to an established pillar of conservation finance.

Of course, flexibility is key and the roadmap will be adjusted as we encounter real-world surprises, new opportunities, or challenges. But with a clear vision and iterative execution, the SFT project could by 2030+ be protecting significant portions of tropical forests that would otherwise be at risk, all through a self-sustaining economic model.

9. Conclusion

The Standing Forest Token project represents a bold synthesis of environmental science, blockchain technology, and innovative finance aimed at addressing one of the defining

challenges of our time: how to preserve high biodiversity tropical forests in a sustainable, scalable way. By **treating standing tropical primary forests as a valuable asset and aligning market incentives with conservation outcomes**, the SFT offers a transformative approach to bridge the persistent funding gap that has hindered tropical forest protection for decades.

In this white paper, we introduced SFTs as a visionary yet tangible solution: a dual-token system where **SFTs provide a tradable, scarce claim on conserved forest hectares**, and **AVTs deliver verified annual ecosystem service outcomes** (carbon sequestration and biodiversity protection) from those hectares. We described how this framework creates a self-contained economy for conservation:

- Forest protectors are empowered with a new stream of finance, turning their role as guardians into one that is financially rewarded and respected.
- Investors and companies gain a transparent, long-term mechanism to support and benefit from conservation, flipping the narrative from short-term offsets to enduring partnerships with ecosystems.
- The value of the token is directly linked to ecological health, operationalizing the concept that preserving nature can be as – or more – valuable than destroying it.

The SFT stands out from conventional carbon or biodiversity markets through its integrated design and emphasis on longevity, yet it is complementary and interoperable with these markets, potentially strengthening them by injecting higher integrity and holistic accounting. We drew on literature and precedents – from **Nature Equity** contracts to **nature-backed currencies** and existing conservation token pilots – to show that the SFT is on the cutting edge of a larger movement to reimagine finance for the planet’s benefit. At the same time, we remain grounded in practical considerations, acknowledging and planning for risks ranging from verification challenges to regulatory hurdles.

The path forward for the SFT project will require **radical collaboration across disciplines**. Technologists must build a secure platform, a distributed network of ecologists and local experts

must carry out the verification, communities must be partners and co-creators, and legal experts must navigate new territory of asset definition. It is, in essence, a transdisciplinary venture that exemplifies the kind of innovation needed to tackle climate change and biodiversity loss. No single aspect (tech, finance, or community action) could succeed alone; the SFT's strength is a systems approach in bringing them together in a novel configuration.

The potential impact is profound. If successfully implemented and scaled, the SFT could generate **sustainable income for thousands of indigenous and local communities**, incentivize protection of **billions of trees and countless wildlife species**, and redirect financial flows away from destructive activities into regenerative ones. It offers a route to make good on global promises – such as conserving 30% of the planet by 2030 – not through aid or charity alone, but through a **market-driven engine of conservation**. In doing so, it could also pioneer new forms of economic thinking where the health of natural capital becomes a foundation for wealth, aligning economic resilience with ecological resilience. The SFT could become a model nature currency, jumpstarting regenerative finance for the protection of other key ecosystems such as ocean reefs or old-growth boreal rainforests.

In conclusion, the Standing Forest Token initiative is more than a technical white paper concept; it is a call to action to **fundamentally realign our economy with our ecology**. By leveraging cutting-edge technology in service of age-old natural wisdom (that forests are more valuable standing), we can create a system where financial ROI and ecological stewardship go hand in hand. The journey from vision to reality will undoubtedly present challenges, but the rewards – a stable climate, thriving biodiversity, and empowered local protectors – are well worth the effort. We invite developers, conservationists, policymakers, and investors to join us in advancing the Standing Forest Token Project, helping to refine the model and bring it to life. Together, we can demonstrate that preserving our remaining tropical forests is not only an ethical imperative but also an attractive and viable investment in our collective future.

Appendix A: Glossary of Terms

Standing Forest Token (SFT) – A fungible digital token representing one hectare of verified standing tropical forest. Built on blockchain, it is backed by the ecological value of that forest area and is tradable in markets.

Annual Verification Token (AVT) – A non-fungible token representing the quantified ecosystem services (carbon sequestration, biodiversity conservation) delivered by one hectare of forest over one year. Issued annually per hectare as long as the forest is protected and verified, and can be sold or retired for environmental claims.

Dual-Token System – The combined use of SFT and AVT in the SFT platform. SFT is the asset token (long-term value, tied to land) and AVT is the yield token (short-term value, tied to performance). Together they encapsulate the full value of conservation.

Forest Stewards – Individuals or organizations that have legal rights and responsibilities over a forest area and commit to its conservation in perpetuity (e.g., indigenous communities, local landowners, conservation NGOs, or government entities managing parks). They supply the SFT system with the forest asset and in return receive tokens and ongoing payments.

Nature-Based Currency (NBC) – A broad term for currency or monetary systems that are backed by natural assets or performance of nature. In context, it refers to the idea of linking currency value or issuance to nature's health (as per Open Earth Foundation's concept).

Nature Equity – A concept of creating financial equity (asset) from nature conservation outcomes, as developed by The Landbanking Group. Nature Equity contracts involve ongoing payments for ecosystem services and create an intangible asset on balance sheets representing natural capital. SFT can be seen as a steward focused implementation of this concept.

Carbon Credit – A certified unit (often one metric ton of CO₂ equivalent) representing a reduction or removal of greenhouse gases. Carbon credits can be traded and used to offset emissions. In the SFT ecosystem, the carbon credit component is embedded in AVTs.

Biodiversity Credit – An emerging concept similar to carbon credits but for measured biodiversity gains (such as habitat protection, species count improvement). There is no single standard as metrics vary by bioregion. The SFT Project's AVT bundles the idea of a biodiversity credit alongside carbon – being Biodiversity primary and carbon secondary.

Voluntary Carbon Market (VCM) – The market where carbon credits are bought/sold outside of regulatory requirements, often by companies voluntarily offsetting emissions. Mentioned as a reference for how SFT's market differs and improves on some VCM issues.

Monitoring, Reporting, Verification (MRV) – A process in climate/biodiversity projects to monitor outcomes (like forest cover or carbon stock), report them, and verify through third parties. MRV is crucial to ensure the integrity of AVTs each year.

Stake (verb, in context of SFT) – To link one's SFT tokens to the specific forest project they originated from, usually through the platform's interface. Staking indicates an active support for that project as there is an annual AVT purchase requirement for maintaining a stake.

Retire (a token) – To permanently remove a token from circulation. In carbon markets, retiring a credit means using it to offset emissions (it can no longer be sold after retirement). In SFT, retiring an AVT would typically be done by a buyer who wants to claim the environmental benefit (carbon offset and biodiversity support) for that year.

Smart Contract – Self-executing code on a blockchain that enforces rules and transactions. SFT and AVT tokens are governed by smart contracts that handle their minting, transfers, and royalties according to predefined logic.

Royalty – In the context of SFT, a fee taken from token sale transactions that is paid to the original forest steward. Implemented via smart contract, it ensures ongoing revenue for conservation from secondary market trading.

DAO (Decentralized Autonomous Organization) – An organization managed through blockchain smart contracts with decisions made by token holder votes. A future governance structure for the SFT platform could be a DAO where stakeholders vote on proposals, representing a decentralized management approach.

FPIC (Free, Prior, Informed Consent) – A principle that indigenous peoples or local communities have the right to give or withhold consent to projects that may affect them or their territories, after being fully informed and before any activity starts. SFT project onboarding with communities follows FPIC to ensure ethical engagement.

REDD+ – A framework (Reducing Emissions from Deforestation and Forest Degradation) used in international climate policy that provides incentives to developing countries to reduce forest loss and associated carbon emissions. SFT can be seen as a market-driven variant aligned with REDD+ objectives but with emphasis on directly benefiting forest protectors using tokens and private capital.

Layer-2 – A secondary blockchain or protocol that operates on top of a main blockchain (Layer-1 like Ethereum) to increase speed and reduce cost. The SFT platform might use a Layer-2 solution for efficiency.

Custodial/Non-Custodial Wallet – A custodial wallet is one where a service (like the SFT platform) holds the private keys on behalf of the user (simpler for user, but trust needed). Non-custodial means the user holds their own keys (more control). The platform may offer both options for accessibility.

Environmental Integrity – A term referring to the credibility and quality of environmental claims (e.g., that a carbon credit truly represents a ton of CO₂ reduced). SFT aims for high environmental integrity by rigorous verification and avoiding double counting.

Impact Investor – An investor who aims for positive social/environmental impact alongside financial returns. SFT is targeted at impact investors who value forest conservation impact as part of their return.

Hectare – A metric unit of area equal to 10,000 square meters (about 2.47 acres). The base unit for SFT – one SFT corresponds to one hectare of forest.