**GreenSteps: Transforming Steps into Environmental Impact**

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**Abstract.** GreenStepsis a decentralized move-to-earn platform that ties physical activity to token rewards and carbon credits, enabling individuals to contribute to measurable environmental impact through a fun and engaging experience. By integrating blockchain technology, the platform guarantees transparent, tamper-proof transactions while storing data securely on chain. GreenSteps offers a scalable, sustainable-oriented platform that connects personal fitness goals and environmental impact through token incentives.

1. **Key Challenges**

Today’s world is heavily shaped by digitalization. Artificial Intelligence is growing rapidly and continuously outperforms manual labor, while blockchain technology introduces digital currencies and carbon credits to global financial and environmental markets. Web3 development brings many advantages but can also create new challenges. Despite its many advantages, digital integration in business operations makes people more sedentary, spending long days in front of screens and less time being physically active. Alongside these personal health challenges, digital progress also intersects universal environmental concerns. Global carbon emissions remain a critical issue, with ongoing efforts looking to reduce greenhouse gas emissions.

Despite increasing societal awareness around environmental responsibility, most individuals lack direct incentives or tools to translate their personal actions into measurable climate impact. Current carbon markets, driven by standards like Verra or Gold Standard, focus on large scale corporate efforts, which ultimately neglects individual contributions. Similar inefficiencies are found in current fitness apps like StepN, which lack a meaningful connection between personal activity and environmental outcome. Without a direct connection between engagement and reward, motivation to contribute to a sustainable future remains low.

In trying to resolve this inefficiency, several challenges emerge. Firstly, it is essential to understand how individual actions, like walking more, can be incentivized in a way that is meaningful in both an individual and environmental way. Secondly, I need to understand how activity data can be verified reliably without creating loopholes for cheating. Also, what is the best way to create an ecosystem that scales efficiently beyond early adopters, while maintaining trust, fairness and engagement? These questions are essential to ask when creating an innovative solution that aims to align personal incentives, such as token rewards, with environmental impact.

1. **Market Analysis**
   1. **Target Market & User Segments**

It is essential to focus on audiences that are most likely to maintain long-term interaction. There are three main groups that come to mind: fitness enthusiasts, climate-conscious individuals, and sustainability-focused organizations. Additionally, it is important to identify what motivates each group to retain engagement over time.

Fitness enthusiasts are driven by goals that are related to health, competition and personal achievement. It serves as an incentive to transform physical activity into outcomes that go beyond personal rewards, contributing directly to broader environmental goals. Meanwhile, climate-conscious individuals are motivated to act towards reducing their personal carbon footprint. Hence, by transforming everyday steps into carbon credits, it is possible to contribute to daily global sustainability.

It is evident that sustainability-oriented organizations, such as universities, NGOs, and companies, represent an emerging institutional market. Such organizations are looking to promote well-being and support sustainability goals. Hence, by encouraging walking and rewarding contributions with environmental impact, this approach can align with their responsibility efforts. Such organizations will also value the ability to track employee progress and foster internal competition toward carbon reduction.

* 1. **Market Size & Growth Potential**

A growing popularity of fitness applications and sustainability applications provides a strong foundation for scaling. The global fitness app market size is expected to reach a value of $12.12 billion by the end of 2025, and there are already millions of users tracking daily steps and physical activity daily. Additionally, the market is estimated to grow at a compound annual growth rate of 13.88% from 2025 to 2030 (Grand View Research, n.d.). GreenSteps has the potential to attract a substantial portion of the existing user base, particularly those who wish to tie personal wellbeing to environmental sustainability.

In addition to individual adaptation, the platform can expand through partnerships with NGOs and universities. These partnerships do not only add credibility and legitimacy to the platform, but also provide access to large networks. In return, GreenSteps offers staking bonuses and rewards to incentivize participation and accelerate adaptation across these communities.

Furthermore, as user adaptation grows, so does the platform’s ability to generate verified carbon credits through validated physical activity. The global carbon market is valued at USD 993.23 billion and expected to grow exponentially in the coming years, ultimately providing opportunities to link fitness with carbon reduction efforts in the long run (Precedence Research, n.d.). Although GreenSteps focuses on the voluntary part of the carbon credit market, this broader growth highlights the increasing demand for carbon credits and the potential value it possesses.

* 1. **Competitive Landscape**

The Move-to-Earn (M2E) industry includes established platforms like StepN, which rewards users with tokens based on physical activity such as walking. While StepN has gained significant attention by gamifying fitness with crypto incentives, the business model does not create a direct connection between personal fitness and measurable environmental outcomes. Additionally, StepN introduces entry barriers, as users must purchase digital sneakers (NFTs) to begin earning tokens.

GreenSteps focuses more on tying user activity directly to verified carbon credits, creating a verifiable environmental impact, and a personal incentive to earn tokens. Our business model eliminates all entry barriers, as step submission only depends on validated physical activity. By linking tokens to real-world carbon credits, GreenSteps gain a competitive advantage by transforming individual physical activity into collective climate gain.

**3 Business Model & Value Proportion**

GreenSteps offers a unique and innovative approach to aligning personal health with environmental impact by linking physical activity to the generation of carbon credits. The core mechanism is based on validating users’ daily step counts and rewarding them with the native token, the GreenSteps Token (GRST). Ultimately, the token serves both as an incentive for users to increase their daily steps and as being a bridge between personal improvement and climate contribution.

Users earn GRST by walking and submitting their step data through the platform. Once validated to ensure authenticity and prevent cheating, these steps are converted into tokens. The accumulated tokens can be redeemed or converted into verified carbon credits, enabling users to directly offset a portion of their personal carbon footprint.

The connection between individual behavior and global sustainability forms the value proposition of GreenSteps. Compared to traditional fitness applications that focus on personal health metrics, GreenSteps ties daily steps directly to tangible environmental efforts by generating carbon credits. This dual incentive model aims to satisfy both personal gains and environmental responsibility.

In addition to encouraging to take sustainability action, GreenSteps provides value to organizations such as universities, NGOs, and corporations wanting to scale their sustainability impact. Through potential partnerships, organizatiosn grant features such as staking bonuses and reward incentives for participants, while GreenSteps gain additional revenue streams through sponsorships and corporate licensing agreements.

Ultimately, by positioning GreenSteps as a platform for personal reward and a medium of exchange for environmental impact, the platform establishes a competitive advantage in the Move-to-Earn market. This unique business model transforms everyday actions into contributions towards a critical global challenge in a transparent way.

**4. Business Strategy**

GreenSteps’ business strategy is built around gamification, with the leaderboard system as a core feature. The leaderboard fosters friendly competition by allowing users to compare their contributions with friends, coworkers, and the broader community. This ranked format motivates users to stay active, improve their standing, and increase their participation.

Leaderboard rankings are not merely symbolic; they influence the rewards users earn. Those who achieve top positions on the weekly leaderboard gain access to greater incentives, including additional staking benefits and exclusive partnership rewards. This connection between activity, ranking, and rewards reinforces motivation by linking effort with tangible benefits.

The leaderboard system is intentionally designed to be flexible. Users can compete globally, locally, or within private groups such as workplaces or universities. Within organizational settings, leaderboards facilitate internal challenges where colleagues compete for prizes, fostering both team spirit and personal well-being.

Beyond leaderboard-based rewards, users earn GreenSteps Tokens (GRST) by submitting validated step data, which can be staked to unlock further benefits. Participants who consistently rank highly may gain additional opportunities or advantages tied to their contributions. Additionally, partnerships with organizations can fund exclusive reward pools or sponsor challenges, enabling users to compete for extra bonuses. These partnerships benefit organizations by increasing visibility and supporting promotional efforts, while providing users with additional incentives tied to their contributions.

It is evident that by centering its business strategy on gamified social competition and reward-linked leaderboards, GreenSteps offers a collaborative, motivating, and impactful user experience. The system rewards its most active contributors through increased recognition, partnership-driven bonuses, and enhanced opportunities, aligning individual efforts with both personal and collective environmental goals.

**5 Technical Implementation**

GreenSteps relies on a secure, transparent, and scalable smart contract system to support its goal of aligning personal fitness with environmental impact. The smart contract is designed to verify token rewards, prevent manipulation, and securely link off-chain physical activity to on-chain transactions. Its architecture ensures fairness, scalability, and measurable environmental contribution, which aligns technical implementation with the core objectives of the platform.

**5.1 Smart Contract Architecture & Key Features**

The platform is deployed on the Axiom Chain, an Ethereum Virtual Machine (EVM)-compatible blockchain. It has low transaction fees, is highly interoperable, and compatible with Ethereum’s ecosystem, ultimately making it a great environment for development and testing. The smart contract implements the ERC-20 standard which ensures that the GRST token interoperable with existing wallets and exchanges, and compatible with decentralized finance (DeFi) protocols. Ultimately the ERC-20 standard enables future-proof integration opportunities with broader blockchain systems.

Security and role management are implemented using OpenZepplin’s robust libraries, particularly AccessControl and Pausable modules. AccessControl creates admin and validator roles, each with specific privileges coded directly into the contract. The Pausable module provides a mechanism to pause contract operations in the event of security issues such as bugs, exploits, or fraudulent activity.

Additionally, the smart contract incorporates OpenZepplin’s Upgradable module, which enables the contract logic to be upgraded post-deployment without disrupting ecosystem flow. By implementing upgradability, the platforms retain flexibility to improve features, adapt reward mechanisms, or enhance security in case of discovered weaknesses.

Key functions implemented in the smart contract to ensure operability include:

* submitSteps(): Allows users to submit their weekly step count for validation. This function records the submission timestamp for accountability purposes.
* claimWeeklyRewards(): Lets the user claim their tokens after validation.
* addValidator(): Function that allows the administrator to add a new node that is allowed to approve user step data.
* resetUserBalance(): Resets a user’s balance in cases where fraudulent behavior or invalid data submission is detected.
* blacklistUser(): If a user is caught cheating continuously. This function is only callable by administrator(s).

By incorporating modular function with high permission controls, the contract protects itself from attacks and facilitates future upgrades.

**5.2 Token Supply & Minting Logic**

GreenSteps embrace a controlled token supply which ensures that a new GRST token is minted only once user activity is validated. This makes sure that the issuance is directly tied to real-world contributions, which mitigates inflation. To support long-term token stability and volatility, a fixed maximum supply is established at contract deployment.

Setting a suitable supply cap presents inherent challenges, especially given the uncertainties around user adoption and each user’s lifetime activity. The number of platform participants, their contribution to the ecosystem, is difficult to precisely predicted in advance. Hence, a theoretical upper bound will be estimated by calculating an average person’s lifetime step total.

Ultimately, this supply cap is designed to balance flexibility and scarcity given the expected human physical step capacity. If adoption outperforms expectations, adjustments to the cap may be needed through governance proposals and contract upgrades, essentially allowing the supply to adapt to adaptation.

**5.3 Burning Mechanism**

Token supply is dependent on a burning mechanism to prevent inflation and maintain long-term token value. However, feedback from advisors highlighted that burning tokens during transactions may be perceived as a “tax”, effectively discouraging user participation. This perception will be avoided at all costs, and to mitigate this concern the burning mechanism is perceived to be a sustainability tool rather than a usage penalty.

In our model, tokens will not be burned per transaction. Instead, burning applies solely to unclaimed rewards after prolonged user inactivity. If the user fails to claim their validated rewards within a predetermined inactivity period, a portion of GRST will be burnt.

This mechanism reduces excess token supply without negatively impacting active users. It ensures that the most engaged users retain their rewards, while inactive users contribute to deflationary effects. By controlling oversupply, the mechanism helps control the native token’s long-term value by mitigating price volatility and reducing the risk of sudden sell-offs. It is important to note that the burn rate can be adjusted through future governance proposals, providing flexibility to recalibrate the system in response to platform growth or suboptimal initial burn rates.

**5.4 Carbon Credit Price Integration**

To link GRST directly to carbon credits, GreenSteps aims to integrate a dynamic carbon credit pricing API. This API retrieves real-time market prices for voluntary carbon credit which ensures that the GRST to carbon credit conversion reflects current market prices. Without an API integration, conversion rates would misrepresent the environmental impact of each GRST token minted. If, for example carbon credits price increase drastically (which one could expect in the coming years), a fixed GRST to carbon credit ratio would underfund the environmental action associated with each GRST minted. An API integration ensures that the impact of minting a GRST token stays environmentally accurate over time.

**5.5 Security & Anti-Cheating Measures**

Since GreenSteps currently is a software-driven application, a core challenge that arises is preventing manipulation of step data. Smartphone step counters are vulnerable to artificial movement, and to address this GreenSteps aims to integrate with smartwatches through potential partnerships, which ultimately will provide richer data streams such as GPS and heartrate data. By cross-referencing health data, it is possible for the platform to flag suspicious submissions, such as steps lacking elevated heartrate or GPS movement. This essentially reduces the possibility of cheating through a more robust verification process.

Validators are nodes authorized by the admin and play a critical role by approving or rejecting submitted data. Validators include trusted nodes that contribute to the ecosystem over time and are appointed through the addValidator() function. They apply automated and manual checks to control validation integrity. The validator network may expand through DAO governance voting.

**5.6 On Chain vs. Off-Chain Data Design**

In the current implementation, GreenSteps stores step data, carbon credit and token calculations on-chain. Once a user submits weekly steps, their submission is permanently recorded in the storage of our smart contract to ensure transparency. This procedure ensures that submission data cannot be manipulated and is a valid approach to the early phases of our application. However, once adaptation grows it increases gas costs and storage demands in the long run which ultimately reduces attractiveness.

Future iterations may transition to a hybrid data model to improve storage efficiency, scalability, and privacy compliance. In this model, raw activity data such as individual step counts, GPS logs, and heartrate streams would be stored off-chain in secure, centralized databases. Only essential validation outcomes, token issuance records would be recorded on-chain to maintain verifiability. This approach balances transparency, data protection, and cost efficiency.

**6. Economic Model & Tokenomics**

**6.1 Token Supply, Minting & Burn Logic**

The GreenSteps token (GRST) is minted based on validated user activity. The baseline minting rate is set to 1 GRST per 1,000 validated steps to ensure that every token is tied to tangible effort.

A theoretical maximum supply is estimated using:

Max individual steps = Average daily steps × days per year × expected use period

Assuming an average of 7,5000 steps per dat, 365 days per year, and a usage period of 60 years:

Max individual steps = 7,500 × 365 × 60 = 164,250,000

Max GRST supply = 164,250,000 ÷ 1,000 = 164,250 GRST

Assuming an early phase user base of 10,000 individuals:

Max total supply = 164,250 × 10,000 users = 1,642,500,000 GRST

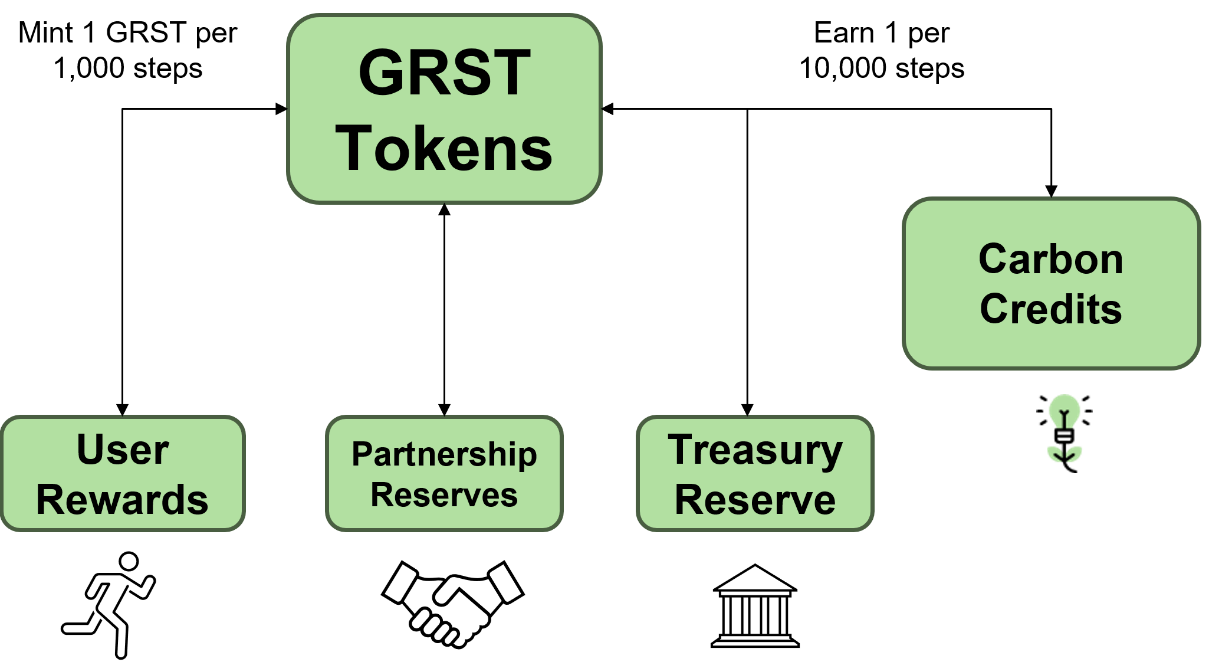
This supply cap ties supply growth directly to real-world validated steps. However, governance mechanisms allow future adjustments of the cap in case of unexpected adoption growth.

Given total supply, the smart contract uses a burn mechanism to maintain scarcity and value. Rather than burning per transaction, which essentially works as a tax, the system burns 5% of unclaimed GRST after three months of user inactivity. For instance, if a user submits 1,000 steps that become successfully validated, 50 GRST will be burnt if the user fails to claim them within the threshold. This deflationary mechanism helps reduce oversupply without punishing active contributors in the ecosystem, ultimately contributing to a stable token price in the long run.

**6.2 Token Utility & Incentives**

GRST serves as the main reward for contributing to the ecosystem and an exchange for environmental impact. Users can redeem tokens for verified carbon, directly contributing to with a sustainable impact. Alternatively, tokens may be staked to earn additional benefits, fostering long-term engagement.

Staking incentives scale with leaderboard performance, where higher ranking grants user with enhanced staking bonuses. Additionally, organizational partnerships may sponsor exclusive reward pools for internal leaderboards, providing more motivation and advertisement for partner organizations.





**6.3 Allocation & Sustainability Design**

The token flow chart in figure 6.2 shows the core pathways of GRST. While the diagram highlights operational flows, the total token allocation encompasses a broader structure to balance growth, incentives, and operability.

The initial GRST token allocation takes the following distribution:

* **Community & Rewards (40%):** A substantial number of tokens are allocated towards the community to build a strong community in the early phase. It incentivizes user participation, staking bonuses and long-term engagement.
* **Liquidity (10%):** It is important to provide liquidity for exchanges and decentralized trading, ensuring GRST holders can transact freely.
* **Team & Advisors (10%):** Allocated to platform contributors and trusted advisors who provide strategic guidance and mentorship.
* **Marketing (15%):** To ensure efficient scaling both locally and internationally, it is essential to set aside a budget for marketing.
* **Development (25%):** Funds technical development, API integrations and platform maintenance.

This allocation ensures sufficient reserves not only for user rewards but also for development, marketing, advisors and liquidity. In the future, governance proposals may revise allocation ratios in case of shifting priorities.

**7. Governance**

The governance model of the platform initially relies on admin-led decision making. The admin holds key permission controls including assigning validators, pausing contract operations, and resetting user balances. This centralized approach offers benefits during early development because it enables effective decision making, which further ensures that the platform can react quickly to potential technical challenges. However, as the user base grows, GreenSteps will transform into a decentralized governance through DAO (Decentralized Autonomous Organization). In this system, the users will grant voting power based on the contribution they make to the platform (e.g., the number of tokens they mint). Key decisions that are to be voted on include burning rates, reward pool allocations and total GRST supply adjustments. Ultimately, a DAO-governance approach improves transparency, engagement and long-term operability. It is also an incentive for users to keep contributing to the platform, knowing their participation grant them more influence in affecting the way GreenSteps develops in the future. As the admin, I believe it remains important to introduce governance safeguards such as time-locked proposals and delegated voting mechanisms to make sure that decisions are thoughtfully considered before execution. By evolving towards a DAO governance framework, GreenSteps will develop a collaborative community that seeks to improve the platform through shared interests.

**8. Conclusion**

I developed GreenSteps to explore how fitness, sustainability and user engagement could merge through a decentralized application. By connecting physical activity to token rewards and carbon credits, GreenSteps offers a sustainable way toward personal and environmental impact. The platform is still in early development but seeks to become a strong contender in the move-to-earn market.

A green and grey logo

AI-generated content may be incorrect.

Changes to smart contract:

* Set max supply
* Upgradable contracts
* Burn mechanism
* Dynamic carbon credit pricing API ???? May be to advanced for now
* Staking

# References

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