TRAILASAUR

WHITEPAPER

A Blockchain-Integrated Ecosystem for Mountain Biking

TRAILASAUR LLC
Innovating Fitness, Community, and
Rewards through Web3

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Introduction

Overview of TRAILASAUR

TRAILASAUR is a blockchain-integrated mountain biking ecosystem that gamifies the riding experience through performance-based rewards, in-app progression, and a thriving rider community. By leveraging smart contracts, location tracking, and decentralized technologies, TRAILASAUR transforms real-world outdoor activity into a dynamic and rewarding digital journey. Whether you're a casual weekend rider or a dedicated enduro competitor, TRAILASAUR offers tools to track, improve, and celebrate your progress—all while earning cryptocurrency rewards in the form of Trailium (TRLM) tokens.

Mission

To inspire and empower riders of all levels through technology, transforming outdoor adventure into a rewarding and connected experience—on and off the trail.

Vision

To become the leading global platform for gamified outdoor fitness, combining Web3 innovation, community-driven growth, and real-world performance incentives to create a healthier, more connected, and adventure-filled future.

Market Opportunity

The Rise of Gamified Fitness

In recent years, gamified fitness has emerged as a powerful motivator for physical activity. Platforms like Strava, Peloton, and Zwift have demonstrated how leaderboards, achievements, and virtual rewards can boost engagement and long-term user retention. As fitness continues to merge with digital ecosystems, consumers are seeking experiences that not only track performance but also provide purpose, challenge, and community.

The outdoor recreation market, valued at over $1 trillion globally, remains largely untapped by gamified systems. Cyclists and trail athletes are ready for a platform that makes every ride feel like a game, complete with goals, feedback loops, and progression mechanics.

Web3 Integration in Sports & Outdoors

Web3 brings new dimensions to outdoor activity by introducing verifiable digital ownership, decentralized rewards, and permissionless interaction. With the rise of fitness NFTs, on-chain achievements, and crypto-powered economies, athletes can now earn, trade, and showcase their accomplishments in new ways.

TRAILASAUR leverages this shift by using the Polygon blockchain to reward riders with TRLM tokens, record achievements immutably, and create a transparent, community-governed ecosystem. As traditional industries move toward tokenization, TRAILASAUR stands at the intersection of adventure sports and decentralized technology.

Platform Architecture

Core Components

TRAILASAUR is built on four interconnected components that deliver a seamless, gamified mountain biking experience:

- **App**: The TRAILASAUR mobile app enables users to record rides, track stats, complete challenges, and interact with a narrative-driven trail system. Built with an offline-first mindset, it ensures full functionality even without cell service.

- **Token (TRLM)**: Trailium (TRLM) is the utility token that powers rewards, in-app purchases, and progression. Minting is capped at 5% per year to ensure long-term sustainability and value alignment.

- **Store**: An in-app marketplace where users can redeem TRLM for gear, merch, virtual items, and event access. The store supports both digital and physical products and helps reinforce ecosystem engagement.

- **Leaderboard**: Public, transparent leaderboards rank riders based on challenge completion, speed, consistency, and creativity. Competitive and casual riders alike can earn recognition and status.

Offline-First Design & Edge Functionality

TRAILASAUR was built with the unique challenges of outdoor activity in mind. Most trail systems lack consistent internet coverage—especially in mountainous or wooded areas. To address this, the app:

- Caches trail data locally

- Records rides using GPS with no active data connection

- Stores progress securely on-device until reconnected

- Enables partial functionality even in airplane mode

This approach ensures that riders never lose progress due to lack of service and allows TRAILASAUR to function as a true companion on the trail—not just when connected.

Data Collection & Privacy

Respecting user privacy is a foundational value. TRAILASAUR only collects the data necessary to power its core features—such as GPS location, elevation, ride duration, and in-app activity. All user data is:

- Stored securely using end-to-end encryption

- Controlled by the user, with export and deletion available at any time

- Never sold to third parties

Future iterations will explore optional on-chain data storage for transparency and decentralized identity features for secure, verifiable rider credentials.

Trailium Token (TRLM)

Purpose & Utility

Trailium (TRLM) is the native utility token of the TRAILASAUR ecosystem. It underpins every aspect of the platform's gamified experience, serving both as a reward mechanism and a functional currency. TRLM encourages real-world activity, consistent engagement, and progression across the platform.

Primary Utilities Include:

- **Performance Rewards**: Earned for completing rides, hitting personal records, or conquering specific trails.

- **Challenge & Streak Incentives**: Bonuses for completing weekly quests, maintaining riding streaks, and exploring new locations.

- **In-App Store Currency**: TRLM can be used to purchase virtual goods (badges, skins) and physical merchandise (gloves, gear, apparel).

- **Community & Event Access**: Token holders can unlock participation in exclusive events, community voting, and real-world meetups.

Token Specifications

- **Token Name**: Trailium

- **Symbol**: TRLM

- **Decimals**: 18

- **Total Supply Cap**: 1,000,000,000 TRLM

- **Contract Address**: 0xE71Df2c71c19754Cf256eadD7FB9D732bA0FB21D

- **Standard**: ERC-20 (Polygon Network)

- **Smart Contract Audited**: Internal testing complete, open for third-party audit submissions

TRLM is deployed on the Polygon blockchain for its low gas fees, fast transaction speeds, and compatibility with Ethereum-based tools.

Minting & Annual Cap Mechanism

TRLM's minting is governed by a strict cap to ensure sustainable tokenomics and avoid inflation:

- **Annual Mint Cap**: A maximum of 5% of the total supply (50,000,000 TRLM) can be minted per year.

- **Role-Based Control**: Only addresses with the `MINTER_ROLE` can initiate minting.

- **Block Timestamp Logic**: The smart contract determines the current year by block timestamp, ensuring mint limits reset yearly.

- **Transparency**: Minting activity is logged and viewable on-chain, with events emitted for every mint action.

This design ensures a consistent and predictable token supply schedule aligned with platform growth.

Burning Functionality

TRLM includes a secure and controlled burning mechanism to support token utility and deflationary actions:

- **Self-Burning**: Authorized addresses (with `BURNER_ROLE`) may permanently burn tokens from their own balance.

- **Non-Reentrant**: Burn transactions are protected with reentrancy guards.

- **Supply Impact**: Burned tokens are permanently removed from circulation, reducing the total supply and potentially increasing scarcity.

The burn function can be integrated into challenge rewards, limited-time events, and deflationary mechanics to support long-term value.

Smart Contract Design

Role-Based Access Control (Admin, Minter, Burner)

Trailium's smart contract architecture is built using OpenZeppelin's battle-tested libraries and follows a modular, role-based permission system:

- **Admin (`DEFAULT_ADMIN_ROLE`):**
  The highest authority role. Admins can grant and revoke roles, adjust permissions, and manage protocol-level governance. This role is assigned to the deployer upon creation but can be transferred or expanded for multisig governance later.

- **Minter (`MINTER_ROLE`):**
  Wallets with this role are authorized to mint TRLM tokens within the constraints of the yearly mint cap. This role can be assigned to automated reward distribution systems, DAO functions, or treasury-controlled addresses.

- **Burner (`BURNER_ROLE`):**
  Addresses with this role are allowed to burn tokens from their own balance using the `burnFromSelf()` method. This role can be assigned to challenge/reward contracts, community event wallets, or users participating in deflationary campaigns.

These roles ensure controlled access to critical functions and prevent unauthorized usage, keeping the contract secure and adaptable.

Security Features

Trailium's smart contract was developed with several key security principles:

- **NonReentrant Modifier**:
  Reentrancy guards are applied to all sensitive methods (e.g., `mint`, `burnFromSelf`) to prevent recursive exploits.

- **Zero Address Checks**:
  Functions like `mint` explicitly prevent actions involving the zero address to avoid accidental token loss or misuse.

- **Annual Mint Cap Enforcement**:
  Minting is restricted by a built-in cap mechanism tied to block timestamps, ensuring no more than 5% of the total supply can be created each year.

- **Transparent Events**:
  All minting and burning activities emit standardized events (`TokensMinted`, `TokensBurned`) to provide full on-chain transparency and simplify auditing.

- **OpenZeppelin Inheritance**:
  The contract inherits from widely used and audited contracts like `ERC20`, `ERC20Burnable`, `AccessControl`, and `ReentrancyGuard`.

Audit & Testing Summary

- **Internal Testing**:
  The smart contract underwent extensive internal testing using Hardhat, with tests verifying:

  - Role-based access enforcement

  - Yearly minting cap logic

  - Burn function behavior

  - Reversion on invalid inputs

- **Fuzz Testing**:
  Time-based edge cases and mint limits were stress-tested using simulated fuzzing techniques to validate the robustness of the timestamp logic.

- **External Audit Plans**:
  An external audit is planned post-deployment and community testing phase. Audit partners are currently under evaluation, and bounty programs will be introduced for community contributions.

- **Verification**:
  The contract has been deployed and successfully verified on PolygonScan, with full bytecode match and flattened source available.

Gamification & Rewards System

XP & Progression Model

At the heart of TRAILASAUR is a progression system inspired by successful gamified platforms. Users earn **Experience Points (XP)** by completing rides, reaching milestones, maintaining consistency, and tackling new or difficult trails. This progression system encourages continued participation and rewards personal improvement.

- **XP Accrual** is calculated based on:

    - Distance and elevation

    - Speed and consistency

    - Trail difficulty and rarity

    - Community engagement and event participation

- **Leveling Up**:

    - Unlocks access to exclusive challenges, trails, and cosmetic upgrades

    - Increases earning potential and multiplier bonuses in events

    - Creates visible status within the app's community leaderboard

This system makes fitness rewarding beyond physical progress, helping riders feel a constant sense of achievement.

Challenges, Streaks, and Achievements

TRAILASAUR incorporates multiple layers of gamified motivation to keep users engaged:

- **Daily/Weekly Challenges**:

    - Complete a minimum distance

    - Ride a new trail

- ○ Beat your personal best

- **Streaks**:

  - ○ Maintain consecutive days/weeks of riding to unlock bonuses

  - ○ Break a streak and lose momentum—adding healthy pressure to stay consistent

- **Achievements**:

  - ○ Earn permanent badges for accomplishments like:

    - ■ "Trail Blazer" (Complete 10 new trails)

    - ■ "Climber" (Achieve 1,000m elevation in one week)

    - ■ "Community Rider" (Participate in group rides/events)

All of these contribute to a rich profile that becomes a digital trophy case of a rider's journey.

In-App Store and Purchasable Items

TRLM, the native token of TRAILASAUR, powers a built-in store where users can redeem rewards and make purchases:

- **Available Items**:

  - ○ Branded gear: gloves, jerseys, water bottles, etc.

  - ○ Digital unlocks: map overlays, weather layers, trail difficulty heatmaps

  - ○ Cosmetic upgrades: avatar styles, trail banners, medal icons

- **Special Offers**:

  - ○ Limited-edition rewards based on seasonal events

  - ○ Partnered product bundles

  - ○ XP multipliers and boosters for extra progression

- **Redeemable via TRLM**:

    - All purchases are transacted in Trailium (TRLM), creating a direct use case for the token and strengthening the ecosystem's economy.

Through these systems, TRAILASAUR ensures riding is not just beneficial physically—but also fun, motivating, and personally rewarding.

Ecosystem and Community

Rider Clubs & Social Features

TRAILASAUR fosters a vibrant, inclusive, and interactive ecosystem where riders are more than just users—they're community members, teammates, and leaders.

- **Rider Clubs**:

    - Users can form or join clubs based on region, discipline (XC, Enduro, etc.), skill level, or shared goals.

    - Clubs can issue internal challenges, share group rides, and compete in team-based events.

    - Clubs create friendly competition and foster a sense of identity and belonging.

- **Community Feed**:

    - Share completed rides, trail reviews, photos, and achievements.

    - Comment, like, and follow fellow riders to build in-app connections.

- **Ride Sharing & Group Rides**:

    - Schedule and promote group rides.

    - Drop-in functionality for local meetups or traveling users.

These features turn TRAILASAUR into more than a tracker—it becomes a digital trailhead where community thrives.

Coaching, Mentorship, and Leaderboards

To elevate performance and provide structure for growth, TRAILASAUR enables both peer mentorship and competitive recognition.

- **Coaching & Mentorship**:

    - Experienced riders can register as community mentors or coaches.

- ○ Mentors gain additional XP or TRLM for helping new riders complete trails, improve technique, or stay consistent.

- ○ Structured challenges allow mentees to unlock progress milestones.

- **Leaderboards**:

  - ○ **Global**, **Regional**, and **Club-specific** leaderboards keep competition fresh and local.

  - ○ Riders are ranked by total XP, streak consistency, trail difficulty, and TRLM earned.

  - ○ Specialized boards for disciplines (e.g., Downhill, Climbing, Sprint) recognize diverse strengths.

- **Event Integration**:

  - ○ Live leaderboards during real-time events

  - ○ Season-based rankings with reset intervals and rewards

Together, these systems cultivate a layered ecosystem where every rider has a place—whether as a casual explorer, competitive athlete, mentor, or club leader.

Roadmap

Development Phases

- **Phase 1: Platform Development (Q2 2025 - Q4 2025)**

  - Design and develop the TRAILASAUR mobile application with core features including ride tracking, performance analytics, and basic gamification elements.

  - Implement the Trailium (TRLM) token to facilitate in-app rewards and transactions.

  - Conduct initial testing phases to ensure platform stability and user satisfaction.

- **Phase 2: Community Building and Market Entry (Q1 2026 - Q2 2026)**

  - Launch targeted marketing campaigns to attract early adopters and mountain biking enthusiasts.

  - Establish partnerships with local biking clubs and organizations to foster community engagement.

  - Introduce social features within the app, such as rider clubs and leaderboards, to enhance user interaction.

- **Phase 3: Feature Expansion (Q3 2026 - Q4 2026)**

  - Integrate advanced gamification elements, including challenges, streaks, and achievements, to boost user retention.

  - Expand the in-app store with a wider range of purchasable items and services.

  - Implement coaching and mentorship programs to support rider development.

Future Expansion Plans

- **Augmented Reality (AR) Integration**

  - Develop AR features to provide interactive trail navigation and real-time performance feedback, enhancing the riding experience.

- **Organized Events**

- ○ Host virtual and real-world events, such as races and community rides, to strengthen user engagement and promote the TRAILASAUR platform.

- **Multiplayer Functionality**

  - ○ Introduce multiplayer modes that allow users to compete or collaborate with friends and other riders in real-time, fostering a more dynamic and social environment.

Total Supply and Distribution

Trailium (TRLM) is the native utility token of the TRAILASAUR ecosystem with a fixed total supply of **1,000,000,000 TRLM**. The distribution model ensures sustainability, incentivized usage, and long-term growth.

Initial Token Allocation:

Category	Allocation	Tokens
In-App Rewards & Incentives	45%	450,000,000 TRLM
Liquidity Pool	10%	100,000,000 TRLM
Team & Development	20%	200,000,000 TRLM
Marketing & Community	15%	150,000,000 TRLM
Reserve & Contingency	10%	100,000,000 TRLM

Role Wallets (Treasury, Liquidity, Ops, etc.)

To promote responsible fund management and operational clarity, distinct wallets have been created with dedicated roles:

- **Treasury Wallet**: Holds reserve funds and manages long-term sustainability.

- **Liquidity Wallet**: Used to provide liquidity on decentralized exchanges (DEXs) and support healthy market behavior.

- **Operations Wallet**: Covers development expenses, infrastructure, and day-to-day project needs.

- **Marketing Wallet**: Funds advertising, influencer campaigns, and community events.

- **Development Wallet**: Used for incentivizing core contributors, bounties, and feature development.

- **Rewards Wallet**: Automatically interacts with the smart contract to distribute rewards for rides, achievements, and leaderboard placements.

All wallets are governed with multi-signature security where applicable, and monitored by transparent smart contract logic.

Liquidity Pool Plans

- A **primary liquidity pool** will be established on **QuickSwap** (Polygon network) using a TRLM/MATIC pair.

- Initial liquidity will be seeded from the Liquidity Wallet with locked tokens to build trust and prevent rug-pull risks.

- A portion of platform transaction fees (e.g., store purchases) may be reinvested into the pool to support long-term liquidity.

- Liquidity incentives may be introduced to encourage community-provided liquidity via yield farming or staking mechanisms.

TRLM's tokenomics are designed to incentivize real-world activity, promote ecosystem health, and reward meaningful participation without relying on extractive or inflationary models.

Long-Term DAO Considerations

While TRAILASAUR is initially governed by its founding team for agile development and rapid iteration, a gradual transition toward decentralized governance is a core part of the project's long-term vision. As the community grows, decision-making power will be distributed to token holders and active contributors to ensure transparency, sustainability, and user ownership.

Future DAO Integration Plans Include:

- **Phased governance rollout** once the platform reaches user and token distribution milestones.

- Establishing a **DAO framework** where TRLM holders can vote on critical ecosystem decisions.

- Creating **working groups or subcommittees** for areas such as trail verification, feature prioritization, and grant allocations.

This approach enables TRAILASAUR to remain responsive in its early stages while laying the foundation for an inclusive, community-driven future.

Community Proposals & Voting

When DAO functionality is implemented, holders of TRLM will be able to:

- **Submit proposals** for new features, reward mechanisms, partnerships, or allocation of community funds.

- **Vote** based on token weight or reputation-based systems to prevent governance manipulation.

- Use **on-chain voting tools** (e.g., Snapshot, Tally) for ease of participation and transparency.

Example proposals might include:

- Adding a new region or trail system to the app.

- Adjusting XP rewards for certain trail types.

- Hosting a real-world event or competition with community grants.

Incentives for participation may include voting rewards, reputation boosts, or limited-edition in-app items.

The goal of TRAILASAUR's governance model is to empower its rider community—not just as users, but as co-architects of the platform's future.

Core Contributors

TRAILASAUR is built by a multidisciplinary team passionate about mountain biking, Web3, and user-first product design. The founding team brings experience in software engineering, blockchain development, product strategy, and community building.

- **Cameron Cooper** – *Founder & Lead Developer*
  With a B.S. in Computer Science from Kennesaw State University, Cameron leads both the technical and strategic direction of TRAILASAUR. He brings a background in machine learning, UI/UX, and full-stack development, and is deeply committed to building tools that empower everyday riders.

  - ✉ Cameron@trailasaur.com
  - 🔗 [LinkedIn](#)
  - 🔗 [GitHub](#)

Additional contributors and advisors will be announced as the project expands its development and community partnerships. The team is currently assembling a council of advisors from the fields of:

- Sports technology and wearable analytics

- Blockchain security and smart contract auditing

- Outdoor sports communities and cycling advocacy

Public Profiles

All team members and advisors listed in the whitepaper and on the website will be publicly verifiable through professional platforms like LinkedIn and GitHub. Transparency is a cornerstone of TRAILASAUR's values, and we encourage community members to connect directly and contribute to the project.

We are actively expanding the team—developers, designers, product managers, and trail experts interested in contributing are welcome to reach out through our official channels or Discord community.

Legal & Disclaimers

Compliance Notes

TRAILASAUR LLC is committed to compliance with all applicable regulations governing digital assets, privacy, and consumer protection. The Trailium (TRLM) token is a utility token designed to reward user activity within the TRAILASAUR ecosystem and is not intended to constitute a security or financial instrument under U.S. or international law.

The project team will continue monitoring legal developments in blockchain and Web3 regulation and will adapt operations accordingly. TRAILASAUR does not offer financial advice or investment services. Participation in the platform, token usage, and any related rewards are at the discretion of users and subject to local laws.

Terms of Use

- Participation in the TRAILASAUR ecosystem and usage of the Trailium (TRLM) token implies acceptance of the project's terms of service and privacy policy, as published on trailasaur.com.

- Users are responsible for securing their own wallets and assets.

- TRAILASAUR does not guarantee token value appreciation or resale markets.

- Use of the app, token, and community features is subject to moderation and may be restricted in cases of abuse, spam, or violation of community guidelines.

White Paper Details Subject to Change

This whitepaper is a living document and is intended to provide insight into TRAILASAUR's current strategy and architecture. As the project evolves, elements of this document—including roadmap items, token distribution, and ecosystem mechanics—may be updated to reflect:

- Market shifts

- Regulatory changes

- Community feedback

- Technological innovations

Any major changes will be transparently communicated via TRAILASAUR's official channels, including the website, GitHub, and Discord. We encourage stakeholders to stay informed and actively participate in shaping the platform's direction.

For inquiries or further clarification, please contact the team at trailium@trailasaur.com or visit https://trailasaur.com.

Appendices

Smart Contract Address

- **Trailium Token (TRLM):**
  0xE71Df2c71c19754Cf256eadD7FB9D732bA0FB21D

Useful Links

- **Official Website:** https://trailasaur.com

- **Token Logo (32x32 SVG):** SVG Logo (GitHub)

- **GitHub Repository:** https://github.com/trailasaur

- **Whitepaper Repository:** *(to be hosted or linked as needed)*

- **PolygonScan Token Info:** View on PolygonScan

Social Channels

Marketing / Display

- Instagram

- TikTok

- YouTube

- Pinterest

Community / Interactive

- Reddit

- [Discord](#)

Business / Professional

- [X (Twitter)](#)

- [LinkedIn](#)

Thank you for exploring the TRAILASAUR vision. Together, we ride into the future. 🦖🏞️