Kaskad

A bounded governance Lending Protocol with In-house Oracle Integration for the Kaspa Ecosystem

Version 1.0

Contents

I. Project Overview

1) Purpose

What Kaskad is: a decentralized lending and liquidity protocol built on the Kaspa ecosystem. Its objective is to establish a transparent and governance-directed infrastructure for liquidity formation, designed to align with regulatory expectations and activity-based participation logic. The protocol introduces bounded governance and verifiable safeguards to support decentralized liquidity interactions within Kaspa's emerging decentralized finance environment.

What Kaskad is not: a platform confined to a single execution environment. Rather, Kaskad is designed as chain-agnostic lending infrastructure built to service quality lending across the Kaspa ecosystem; from existing Layer 2 environments to Kaspa L1's sovereign native layer as technical capabilities evolve. The protocol's current deployment on Igra represents the first implementation of a broader vision: establishing robust, compliant, and battle-tested lending mechanics that can operate wherever the Kaspa ecosystem grows. As builder tools mature and Kaspa's native programmability expands through covenants and vprogs, Kaskad's framework is positioned to extend across multiple execution layers, serving liquidity formation wherever it's most effective for users and the network.

2) Oracles and Trustless Price Reporting

Kaskad launches with an Oracle V1 model, an enhanced implementation of established oracle mechanisms combining a TEE-based data ingestion layer with a composite anomaly detection metric developed under the supervision of Eliott Méa. The V1 provides reliable, production-grade price feeds for collateral valuation, liquidation triggers, and incentive calculations from day one.

In parallel, a next-generation trustless oracle model (V2) is under active research by Eliott Méa and Paul Colagrande. This research aims to propose an incentive-compatible mechanism in which honest reporting of reference prices is the most rational economic strategy for participants. Unlike conventional oracle systems that rely on trusted relayers or committee structures, the V2 design leverages Kaspa's blockDAG architecture and proof-of-work security to minimize manipulation risk.

Oracle V2 is in active R&D and is not part of the launch configuration. Its integration is positioned on the protocol's roadmap, contingent on successful research outcomes, independent validation, and governance approval. Our intent is to evolve in step with the broader Kaspa research ecosystem and provide a long-term resilient architecture for decentralized lending — without depending on unproven infrastructure for live financial operations.

3) Rationale

Kaspa's blockDAG consensus offers high throughput, rapid block confirmation, and scalability advantages over linear blockchains. However, the ecosystem currently lacks a compliant lending & liquidity operation protocol and a competitive, decentralized liquidity interaction infrastructure capable of bootstrapping liquidity from existing chains (like Ethereum, Solana or Base, to name a few). This absence restricts Kaspa users from unlocking liquidity against their assets and limits the development of a native decentralized finance layer.

Kaskad addresses this gap by introducing a fully compliant and incentivized framework built with bounded governance, activity-dependent incentives, and systemic safeguards against misuse. In addition, by building on Kaspa's forthcoming trustless oracle infrastructure, Kaskad integrates a structural safeguard against one of the most persistent vulnerabilities in decentralized lending systems: inaccurate or manipulated price feeds.

4) Key Differentiators

The Kaskad protocol is designed to establish a compliant and sustainable lending and liquidity activity infrastructure within the Kaspa ecosystem. Its differentiating features can be grouped into four domains: compliance orientation, governance design, incentive logic, and planned oracle integration.

From a compliance perspective, the protocol is underpinned by the incorporation of POW Incentives S.A. incorporated in the British Virgin Islands, providing the corporate framework for the token; the project intends to align its operations with principles reflected in the EU MiCA framework. **POW Incentives S.A.** acts solely as an initial technical contributor and administrative service provider for deployment. It does not issue, guarantee, or manage the $KSKD token post-deployment, nor does it provide investment or custodial services.

Token functions are limited to activity-based participation, bounded governance, and protocol-level coordination. The $KSKD supply is capped at issuance, and its incentive logic is constrained by governance floors and bounded ranges, ensuring the token does not imply any form of ownership, revenue participation, or financial return. These safeguards were established at incorporation to align the token with regulatory expectations and provide a compliant operational basis for protocol activity within the Kaspa ecosystem.

The governance framework assigns voting rights exclusively to $KSKD holders who actively stake and provide liquidity to the protocol. Governance decisions are limited to bounded parameters, ensuring that no single cohort can reduce operational safeguards below critical thresholds. This model was designed to maintain the neutrality of governance while still enabling the onchain participants to influence parameters central to protocol incentives. This approach (i.e., the bounded parameters) also allows us to better monitor feedback from the DAO and let new ideas emerge naturally, rather than risking to launch the governance layer with no initial guidance and let it become controlled by a concentrated cohort of participants whose incentives may not align with protocol resilience, leaving the rest of the platform to face a potentially chaotic outcome.

The incentive structure itself is based on epoch-level activity-based allocations. Suppliers and liquidity users may receive allocations calibrated to their contribution, with liquidity user incentives scaled according to utilization. This scaling mechanism prevents artificial inflation of liquidity activity, since only markets with genuine demand can result in the full liquidity user incentive pool allocation. Unallocated emissions are redirected to the DAO Treasury Pool where governance participants may determine their use strictly for protocol-related purposes, such as future incentive adjustments, ecosystem support, or maintenance activities, without any implication of profit distribution or market-making.

Protocol fund management is implemented through predefined smart-contract vaults that ensure transparency and prevent discretionary use of resources. All protocol-level fees and incentive reserves are automatically directed to two immutable vaults: the DAO Treasury Pool, governed on-chain by participants for community and incentive purposes, and the Operational Treasury, designated for infrastructure, audits, compliance, and ecosystem support. Token holders have no entitlement to these resources, and all allocations occur only through transparent governance procedures within bounded, reportable parameters.

Finally, a further differentiating element lies in Kaskad's exclusive oracle integration. While Kaskad will launch with enhanced versions of existing oracle mechanisms, the protocol roadmap includes adoption of Kaspa's forthcoming trustless oracle framework, developed by Eliott Mea. This model aims to introduce an incentive-compatible reporting system, where honest provision of reference prices is the most rational strategy. By embedding these mechanics into collateral valuation, liquidation thresholds, and incentive distribution, Kaskad anticipates a structural reduction in systemic oracle risks that have historically destabilized DeFi lending markets.

Taken together, these differentiators establish Kaskad as a protocol designed for long-term resilience and legal alignment. Its structure reflects both the practical requirements of liquidity formation on Kaspa and the regulatory imperatives governing tokenized participation systems.

5) Vision

Kaskad aims to establish itself as the **reference lending and liquidity operation layer for Kaspa by combining transparent participation incentives with verifiable compliance safeguards and novel Oracle design**. The underlying architecture integrates bounded governance, differentiated incentive logic, and on-chain auditable flows to ensure sustainable liquidity formation.
Beyond liquidity participation, Kaskad positions itself as the protocol designed to evolve alongside Kaspa's ecosystem growth. By planning integration of Kaspa's forthcoming trustless oracle framework, and hopefully integrating the L1 logic when that becomes technically possible, Kaskad seeks to mitigate systemic risks in collateral valuation and liquidation, reinforcing both technical robustness and regulatory defensibility.

II. Technology & Architecture

1. Protocol Layers

a. Base executional Layer: Igra Network

Kaskad is deployed on the Igra Network, a Layer-2 environment designed to extend Kaspa's blockDAG consensus. Igra provides smart contract functionality anchored to Kaspa L1, and is designed to leverage Kaspa's underlying security and throughput characteristics. It operates as an execution environment for DeFi protocols, enabling composability and fast settlement without altering Kaspa's consensus layer.
As an EVM-compatible protocol, Kaskad's smart contract suite is not structurally bound to a single execution environment. In the event that Igra experiences critical infrastructure issues, the protocol's architecture permits redeployment on alternative EVM-compatible execution layers without requiring fundamental changes to lending logic, governance parameters, or treasury routing. This operational resilience is a deliberate design choice: Kaskad is built to serve the Kaspa ecosystem wherever its execution infrastructure is most reliable.

b. Base Protocol Lending layer: AAVE 3.3 Components

Kaskad's lending core uses the Aave v3.3 codebase as an untouched external library. The interest-rate model, liquidity pool logic, collateralization accounting, and liquidation execution mechanics are unchanged from the upstream implementation. This preserves the full benefit of one of the most extensively audited and battle-tested lending codebases in production DeFi, with no modifications that could introduce new attack surfaces at the core layer.
What Kaskad builds on top of this foundation is an entirely custom governance and incentivization layer comprising over 4,300 lines of protocol-specific logic, organized across five modules:

- **Protocol Incentives Module** — epoch-based emission distributions, utilization-weighted borrower rewards, supplier allocations, and anti-gaming eligibility enforcement.
- **Protocol Resource Routing Module** — deterministic fee collection and immutable 65/35 treasury split between DAO Treasury and Operational Treasury.
- **Milestone Incentives Module** — event-triggered incentive allocations with TWAL/TWAP validation, cooldown periods, and challenge windows.
- **Bounded Governance Module** — parameter ranges encoded at deployment, time-locked proposal lifecycle, snapshot-based voting, and hard-coded safety floors.

- **Oracle Integration Module** — price feed abstraction layer supporting V1 (enhanced existing mechanisms at launch) and future V2 (trustless, Kaspa-native oracle currently in R&D).

This separation is deliberate: the lending core handles financial plumbing through a proven, unmodified library; Kaskad's custom layer defines how incentives, governance, treasury routing, and risk parameters operate on top of it. Both layers are independently auditable, and the custom modules can be upgraded through bounded governance without affecting the integrity of the underlying lending logic.

c. Base Protocol Incentives layer: Kaskad Core Components

Kaskad's core logic is implemented as a set of immutable smart contracts. These contracts govern 3 main modules:

- **Protocol Incentives Module** — allocation of activity-based token rewards to participants according to predefined governance parameters
- **Protocol Resource Module** — allocation protocol-generated resources to participants according to predefined governance parameters.
- **Milestone Incentives Module** — on-chain triggered events governed through DAO voting.

d. Governance Layer

Governance participation is available to $KSKD holders who both stake and provide liquidity to the protocol. Voting rights are determined by verified on-chain participation and the duration of active governance commitment. Staking functions solely as a technical signal of engagement, not as a financial stake, and confers no economic or yield benefit. Governance powers remain strictly bounded by predefined on-chain parameters. Governance may adjust technical parameters within fixed ranges (e.g., minimum deposit size, uptime, LTV, etc.), but cannot modify core safeguards below established thresholds.

e. Oracle Layer

At launch, Kaskad will operate with enhanced existing oracle mechanisms. The design will introduce a novel oracle framework, under development by Eliott Mea & Paul Colagrande. This oracle framework aims to enable incentive-aligned price reporting designed to mitigate manipulation risks in collateral valuations and liquidations. We present the detailed logic of this Oracle solution in Eliott's scientific paper.

f. General Safeguards & Compliance Architecture

Kaskad incorporates several structural mechanisms designed to maintain operational integrity and transparency:

- **Epoch-based distribution** is used for incentive allocation, which aligns accrual and settlement to defined time windows, contributing to predictable and transparent incentive cycles.
- **Bounded governance parameters** are coded at the contract level, limiting adjustments to specified ranges and ensuring parameters cannot fall below critical thresholds.

- **On-chain auditability** applies to all protocol flows, with state transitions and treasury allocations verifiable directly from contract data.
- **Treasury resources** are managed through two predefined on-chain vaults: a DAO Treasury for community-voted ecosystem initiatives and an Operational Treasury supporting audits, infrastructure, protocol scaling and compliance. No profit distribution or entitlement exists for token holders.
- **Counterparty attribution and monitoring** applies to large transactions and off-ramps, allowing integration with external compliance frameworks where required.

g. Collateral Diversification and Correlated Risk

A common concern for lending protocols on emerging ecosystems is correlated collateral risk: if all supported assets are denominated in or pegged to a single base asset, a sharp decline in that asset's value could trigger simultaneous liquidations across the protocol.
Kaskad addresses this risk through two mechanisms:
Multi-asset collateral from launch. Through the Hyperlane cross-chain integration, Kaskad supports collateral types beyond KAS-denominated assets from day one. Stablecoins (USDC, USDT), yield-bearing assets, and tokens from 100+ supported networks are eligible as collateral, reducing the protocol's dependence on any single asset's price trajectory.
Conservative LTV ratios for KAS-pegged pairs. For assets that are directly correlated to KAS price movements (such as iKAS), the protocol launches with LTV ratios near 30% — well below the protocol's maximum adjustable ceiling. This conservative parameterization provides a substantial safety buffer against correlated drawdowns. As the protocol matures and liquidity depth increases, governance may adjust these ratios within bounded ranges, but the hard floor of 15% LTV ensures that KAS-pegged collateral can never be leveraged to unsafe levels.
This way, if KAS experiences significant price volatility, the protocol maintains solvency through a combination of diversified collateral sources and conservative risk parameters for correlated assets.

2. Separation of Roles within the Kaskad Protocol

The Kaskad protocol implements a layered separation of roles to clearly define responsibilities and constrain decision-making within bounded, verifiable parameters. This structure is designed to prevent concentration of influence and to ensure predictable outcomes across the system.

a. Core Principles

Roles in Kaskad are encoded with immutability at the contract level. Protocol parameters can only be adjusted within predefined ranges, ensuring that changes remain bounded and verifiable on-chain. No role has unilateral control protocol parameters or resource movements, and contract-level safeguards maintain critical operational thresholds.

b. Defined Roles

Three participant categories are defined within the protocol, each corresponding to a specific path of interaction through which users contribute to Kaskad's operation and governance. These paths (**Path A, Path B,** and **Path C**) represent distinct yet complementary modes of engagement, where participation and influence are derived from measurable, on-chain activity rather than passive holding.
The categorization prevents concentration of control and maintains a functional balance between liquidity provision, governance alignment, and protocol sustainability.

- **Path A** — [TVL Participants]: Users supplying or utilizing liquidity within Kaskad, thereby participating in on-chain protocol activity.
- **Path B** — [Vested $KSKD Holders]: Token holders with time-locked commitments established to support long-term governance alignment during the onboarding phase. These participants have no ownership or profit rights and serve only a functional coordination role within protocol governance.
- **Path C** — [Voters]: Participants who both engage with protocol activity and stake $KSKD tokens, enabling participation in governance procedures. Governance input is limited to technical parameters such as incentive calibration and protocol maintenance, excluding any authority over profit or revenue distribution.

3. Position Stress Testing: iKAS Collateral Scenarios

The following table illustrates how a standard borrowing position behaves under adverse price conditions for iKAS collateral. The scenario assumes a user deposits $10,000 worth of iKAS with a Loan-to-Value (LTV) ratio of 70% and a liquidation threshold of 75%.

Scenario	Collateral Value	Debt	Health Factor	Status
Starting position	$10,000	$7,000	1.07	Safe
iKAS drops 10%	$9,000	$7,000	0.96	Liquidatable
iKAS drops 20%	$8,000	$7,000	0.86	Partial liquidation
iKAS drops 40%	$6,000	$7,000	0.64	Deep liquidation

Table 1: Collateral stress scenario — iKAS at 70% LTV / 75% liquidation threshold

At maximum LTV (70%), even a 10% price decline triggers liquidation eligibility. In practice, the protocol's partial liquidation mechanism closes only enough of the position to restore the Health Factor above 1.0, preserving the borrower's remaining collateral.
Conservative launch parameters. For KAS-denominated pairs specifically, Kaskad intends to launch with LTV ratios near 30%, significantly below the protocol's maximum adjustable ceiling. At 30% LTV, the same $10,000 collateral position would support only $3,000 in borrowing, and the stress profile changes substantially:

Scenario	Collateral Value	Debt	Health Factor	Status
Starting position	$10,000	$3,000	2.50	Safe
iKAS drops 20%	$8,000	$3,000	2.00	Safe
iKAS drops 40%	$6,000	$3,000	1.50	Caution
iKAS drops 60%	$4,000	$3,000	1.00	Liquidation threshold

Table 2: Collateral stress scenario — iKAS at 30% LTV (launch configuration)

At the conservative 30% LTV, iKAS would need to lose approximately 60% of its value before liquidation is triggered. This provides a meaningful safety buffer during the protocol's early phase, when liquidity depth and oracle responsiveness are still maturing.
Users are encouraged to maintain Health Factors above 1.5 and to monitor positions actively, particularly during periods of elevated volatility.

III. TOKENOMICS

1) Introduction

The $KSKD token constitutes the principal coordination medium of the Kaskad protocol. Its function is to align individual participation with the long-term objectives of sustainable participation, governance stability, and adoption of Kaspa's usage.
Within this framework, $KSKD is designed to function as a **utility token**: it enables on-chain interaction, participation in governance, and access to bounded incentive mechanisms. All token-related operations are activity-based and operate within predefined smart-contract parameters.
The token does not represent equity, profit rights, or claims on external revenue; its design is strictly limited to facilitating governance and participation logic internal to the Kaskad protocol.

2) $KSKD Token: utility and roles

The $KSKD token performs three primary operational roles within Kaskad:

- **Governance Medium**

  $KSKD holders who actively participate in the protocol may obtain governance access as [voters]. Voting influence reflects the duration and consistency of verified on-chain participation, serving solely as a proof of engagement and not as a measure of economic stake or financial contribution. Governance powers are strictly limited to adjusting predefined technical and incentive parameters within fixed, on-chain ranges. Decisions concerning the Supply Adjustment mechanism are executed only within pre-encoded boundaries for maintaining emission efficiency and transparency, and do not permit control or manipulation of token market value.

- **Incentive Access Key**

  Liquid staking $KSKD grants eligibility to qualify for protocol-level activity mechanisms, strictly limited to functional and governance-related purposes. These mechanisms include activity-based allocation linked to user interactions with liquidity pools through the IncentivesDistributor, milestone-triggered rewards from the MilestoneIncentives Pool, as well as other governance-approved, non-financial uses of the DAO Treasury Pool.

  Eligibility is entirely dependent on active engagement with the protocol and on verifiable on-chain contribution to its liquidity and operation environment.

3) $KSKD Token Distribution & vestings

The total supply of $KSKD is fixed at **1 billion tokens** (1,000,000,000) and permanently defined at deployment. No future minting, inflation, or variable issuance is permitted.
The allocation structure aims to support network participation, long-term governance stability, and operational sustainability.

a. Token Distribution

Category	Allocation (% of total)	Purpose
Community and Ecosystem Development — Phase 1	up to 20%	Supports pre-mainnet protocol growth and user onboarding

Community and Ecosystem Development — Phase 2	up to 3.26%	Bootstraps pre-TGE phase and marketing outreach strategies
Activity Incentives	min 39%	Distributed to participants according to predefined on-chain parameters
Commitment Incentives	1.24%	Support protocol stability by providing participation-based allocation to users who maintain defined, time-bound commitments within the system. These allocation are strictly non-financial and are linked only to on-chain engagement and protocol-level coordination
Institutional Participation Program	3%	Facilitates early technical and governance participation by entities contributing verified infrastructure or compliance support. No financial return or guarantee is offered.
Ecosystem Liquidity	18% (10% DEX + 8% Listings)	Ensure launch liquidity and support initial market functioning.
Team	12.5%	Kaskad founders, team members, R&D department and core developer allocations, subject to multi-year vesting to ensure alignment.
Advisors	up to 3%	Strategic guidance and technical expertise.

Together, Protocol Support (61.24%, including Activity Incentives, Ecosystem Liquidity, Institutional Participation Program and Commitment Incentives) and our two phases of Community & Ecosystem Development (23.26%) account for 84.5% of the total supply. These allocations prioritize ecosystem development and protocol sustainability.

b. Vesting Schedules

All vesting parameters are encoded in immutable smart contracts and auditable on-chain. Each category follows specific lock and release mechanics to ensure progressive decentralization and alignment of interests:

- Community Fundraising — Round 1 (20%)

  - 10 % released at TGE
  - 6-month cliff
  - 18-month linear vesting following cliff
- Public Fundraising — Round 2 (3.26%)
  - 20% released at TGE
  - 3-month cliff
  - 12-month linear vesting
- Advisors (3%)
  - 5 % released at TGE
  - 6-month cliff
  - 21-month linear vesting, with releases conditioned on non-financial, contribution-based performance indicators relevant to technical, strategic or operational deliverables.
- Team (12.5%)
  - 0 % released at TGE
  - 9-month cliff
  - 36-month linear vesting thereafter
- Commitment Incentives (39%)
  - Distributed according to the epoch-based emission schedule detailed in the Protocol Incentives Module.
  - Emission parameters are predefined at deployment and may only be modified within fixed on-chain ranges through transparent governance procedures by [voters].
- Institutional Participation Program (3%)
  - Vesting begins once the participation commitment is verified on-chain and continues linearly for 3 to 6 months.
  - Vesting halts immediately if the participant terminates the commitment before completion.
- Commitment Incentives (1.24%)
  - 3 to 7 days vesting cycle corresponding to the defined participation lock period.

4) Preamble — User Onboarding Phase

Purpose :
The User Onboarding Phase is a transitional mechanism introduced to support adoption and activity during the period in which protocol liquidity is still forming. It provides a temporary buffer of activity-based incentives while the system scales toward a level of sustaining operational participation.
During this phase, allocations are partly supported by a predefined onboarding budget and by protocol-usage fees generated through normal on-chain activity.

Reserved Budget :
The onboarding mechanism is supported by a dedicated budget drawn from the community round proceeds, representing up to 25% of that allocation. These funds are routed through a distinct Growth Pool that interfaces directly with the DAO Treasury Pool and the MilestoneIncentives Pool, maintaining verifiable on-chain separation from operational funds.
[Voters] oversee Growth Pool parameters through their bounded rights over the DAO Treasury Pool. This means that disbursements from this pool follow the same principles as all protocol incentives: they are bounded, non-entitlement in nature, and transparently governed.
This transitional model is explicitly finite. The incentive component sourced from the onboarding budget is designed to phase out as the protocol reaches a stable and self-sustaining level of user participation and operational activity. During that phase, the Kaskad protocol will route the Onboarding Phase Budget to the Growth Pool according to pre-established parameters (amount allocated and triggering events) that will be triggered by the Event Milestone Monitor.

Triggering events:
During this phase, the reserved budget will be triggered by both default and specific protocol events.
Default protocol events:

- **Beginning of a new epoch**: each month after TGE event. Allocation: 4% of total Reserved Budget (monthly). Duration: up to 17 months post TGE

Specific protocol events:

- **TGE event**: triggered by Kaskad's official mainnet launch. Allocation: 5.7% of the total Reserved Budget dedicated (one time event). Duration: 1 epoch
- **Network Participation Milestones**:

  When predefined participation or utilization thresholds are achieved and verified on-chain, a limited portion of the Reserved Budget may be released as additional non-$KSKD participation incentives. Allocation between the MilestoneIncentives Pool and the IncentivesDistributor follows transparent on-chain procedures under bounded governance.

  Target levels & allocations:

  - **Level 1 — Initial network participation threshold ($1 M TVL equivalent)**: extra 1.4% of total Reserved Budget (one time event). Duration: 1 epoch.
  - **Level 2 — Initial network participation threshold ($3 M TVL equivalent)**: extra 1.4% of total Reserved Budget (one time event). Duration: 1 epoch.
  - **Level 3 — Sustained participation threshold ($5 M TVL equivalent)**: extra 1.4% of total Reserved Budget (one time event). Duration: 1 epoch.

  - **Level 4 — Expanded utilization threshold ($10 M TVL equivalent)**: extra 2.8% of total Reserved Budget (one time event). Duration: 1 epoch.
  - **Level 5 — Advanced utilization threshold ($20 M TVL equivalent)**: extra 2.8% of total Reserved Budget (one time event). Duration: 1 epoch.
  - **Level 6 — High adoption threshold ($50 M TVL equivalent)**: extra 2.8% of total Reserved Budget (one time event). Duration: 1 epoch.
  - **Level 7 — Mature ecosystem threshold ($100 M TVL equivalent)**: extra 2.8% of total Reserved Budget (one time event). Duration: 1 epoch.

- **Market-recognition events:**

  Upon verified network milestones (e.g., adoption benchmarks validated through the Oracle system), small one-time participation incentives may be released to recognize community contribution. Milestone events may include symbolic recognition linked to network adoption benchmarks, independent of market price or token valuation.

  Challenge windows and cooldowns for TVL Milestone and $KAS prices will be integrated to prevent wash TVL and manipulative activity, as per the anti-gaming system detailed later.

  Milestone events may include symbolic community-recognition triggers linked to protocol-usage data. These events have no direct relation to market price or token valuation.

<u>Duration :</u>
We calibrated the duration of the User Onboarding Phase to last 18 months. After that, future non-$KSKD incentive allocations will rely exclusively on protocol-usage fees and on-chain mechanisms under the same bounded governance logic.
Our public documentation specifies the amounts allocated, their intended purpose, and the addresses holding these funds will be provided to ensure full traceability of all onboarding-related transactions. The onboarding phase is therefore both auditable and temporally limited, serving as a bridge between Kaskad's early participation phase and its long-term autonomous operation.

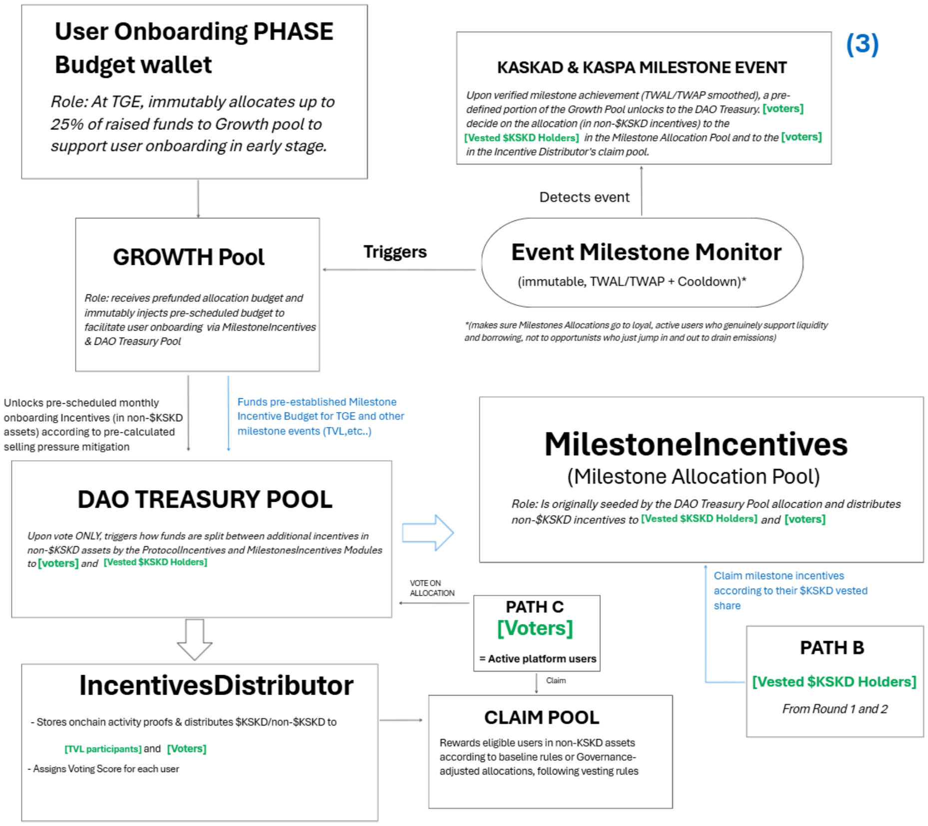

Figure 1: Kaskad's User Onboarding Phase and its interaction with the IncentivesDistributor and the MilestonesIncentives.

5) $KSKD Core Emission Mechanism

A — Protocol Incentives Module

The Protocol Incentives module defines the framework for distributing $KSKD tokens to active participants engaging in liquidity supply and utilization within the protocol, also known as [TVL Participants].
Its objective is to encourage active on-chain participation in liquidity operations while discouraging artificial or manipulative behaviors.

a. Emission Schedule A total of **39% of the fixed token supply (390,000,000 $KSKD)** is allocated to on-chain activity distributions that reward verified participation in network functions and is immutably funded to the **KSKDEmissionVault** at TGE for scheduled monthly emissions. These allocations are technical, non-financial, and do not represent yield or investment returns.
Distribution follows a pre-programmed schedule defined in monthly epochs:

Phase	Duration	Allocation (% of total supply)	Monthly Rate (% of total supply)
Phase 1	0–6 months	2%	$\approx 0.33\%/month$
Phase 2	6–12 months	4%	$\approx 0.66\%/month$
Phase 3	12–18 months	6%	$\approx 1\%/month$
Phase 4	18–35 months	27%	$\approx 1.59\%/month$

Emissions are released to [TVL Participants] in proportion to their verified activity and contribution metrics. Adjustments of emission parameters is limited to predefined on-chain ranges through the protocol's bounded governance process accessible to the [Voters]. We detail the roles of the Bounded Governance in the section below.

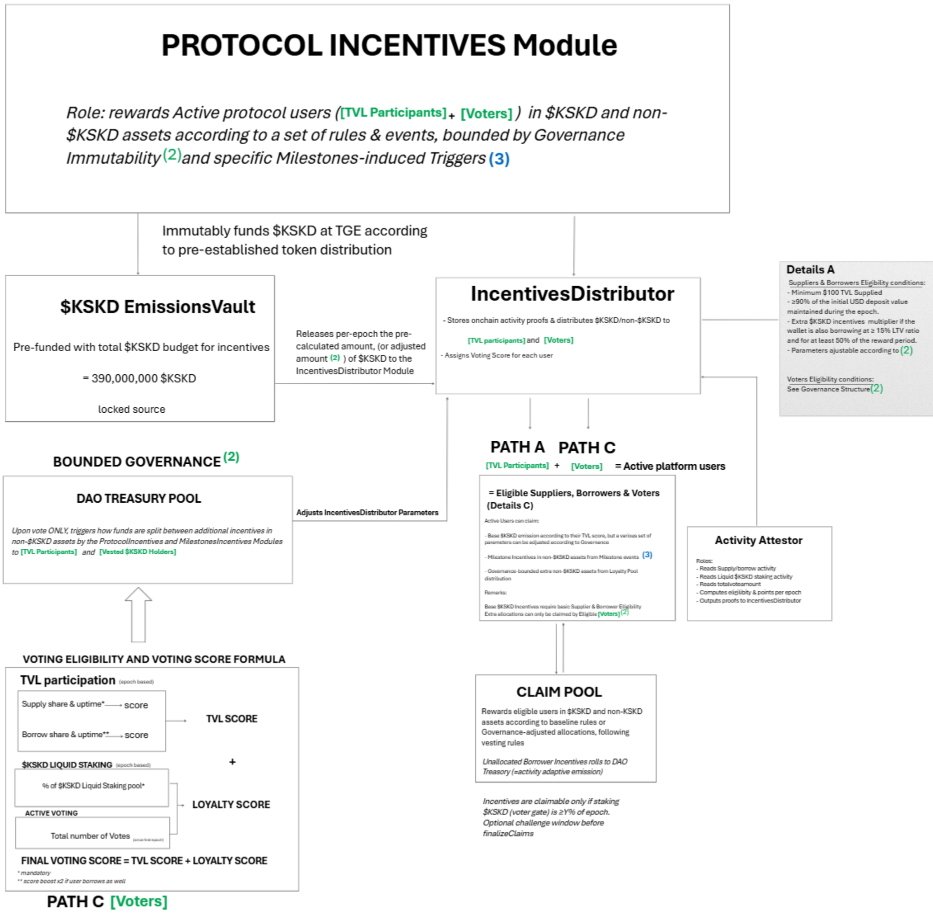

Figure 2:

b. Anti-Gaming Safeguards The anti-gaming framework defines the verifiable conditions under which participants can accrue emissions.
All controls are executed on-chain and are designed to couple incentive access with sustained on-chain participation and verifiable protocol engagement.
Incentive settlement occurs on an epoch basis, removing short-term arbitrage behaviour and ensuring predictable time windows for incentive eligibility and reducing short-term speculative participation.

Epoch-Based Allocation

Each epoch spans approximately one month of block activity. Protocol Incentives are tracked continuously but their complete claim can only occur if participation is maintained until epoch closure.
This model prevents transient liquidity injections or withdrawals immediately before calculation cycles and requires sustained participation throughout the entire epoch duration.

Governance-Controlled Emission Split

While the global emission schedule is fixed at deployment, the relative distribution between

Suppliers and Borrowers is subject to bounded governance parameters.
During each epoch, [Voters] may adjust the emission split ratio within a 40–60% band in either direction.
This mechanism was created to enable adaptive calibration of participation incentives without altering the total emission volume.
Governance cannot bypass or nullify these lower bounds, meaning this model prevents governance capture, preserves minimum operational security thresholds, and ensures predictable emission dynamics across epochs.
For instance, during phases of elevated utilization, the [Voters] may opt for a 40% supplier / 60% borrower allocation to balance protocol activity.
All adjustments are executed on-chain and revert automatically to equilibrium settings if governance activity ceases.

Allocation Logic At each epoch t, total emissions E_t are divided into the governance-defined ratio between suppliers and liquidity users:

$$E_t = E_{sup}(r_t) + E_{bor}(1 - r_t)$$

where $r_t \in [0.4, 0.6]$ represents the governance-voted proportion allocated to suppliers.
Borrower incentives are further weighted by per-asset utilization:

$$E_{bor,i} \propto \frac{TWAL_i}{Cap_i}$$

where $TWAL_i$ denotes the time-weighted average liquidity utilization of asset i and Cap_i is its governance-defined utilization ceiling. This approach maintains efficiency by reducing emissions when utilization remains below equilibrium levels.

c. Eligibility Parameters Eligibility for incentive accrual is determined by on-chain state variables maintained by each asset-pair contract. The conditions include:

<u>Suppliers</u>

- Minimum participation amount = \$100 (cannot be reduced below \$100; adjustable within ±15%).
- Default uptime = 90% per epoch; adjustable ±2.5% but never below 80%.

<u>Borrowers</u>

- Minimum loan-to-value (LTV) = 15% (fixed lower bound).
- Minimum uptime = 50% per epoch (fixed lower bound).

All parameters are bounded: governance may adjust them within fixed intervals but cannot reduce below protocol-defined floors.

d. Recycling of Undistributed Emissions When borrower utilization is below the active cap, the corresponding fraction of emissions remains undistributed and is redirected automatically to the DAO Treasury.
Governance may, within bounded parameters (35–65%), determine whether these unallocated emissions should be reassigned to future activity-based incentive cycles or directed to the protocol's supply-adjustment mechanism, which permanently removes them from circulation for

protocol-maintenance purposes and does not create any entitlement or financial benefit for tokenholders.
For example, if [Voters] decide to allocate 35% of those undistributed emissions to the IncentivesDistributor, then it also means they have voted for the remaining 65% to be sent to the Supply Adjustment Mechanism, as part of its supply-reduction function.

e. Epoch Settlement Incentives accumulate continuously during each epoch and become claimable at epoch closure (1 month). All parameters—including balances, ratios, and eligibility records—are stored and verifiable on-chain without reliance on external oracles or attestations.

f. Voter-Linked Incentive Access Access to additional, non-$KSKD incentives (e.g., milestone-based distributions from the DAO Treasury) is conditioned on dual participation:

- participants must hold an active supplier or borrower position, and
- maintain liquid-staked $KSKD for governance-alignment purposes. This requirement does not provide any form of financial return.

Voting weight increases with the duration and extent of governance-aligned participation, not with financial contribution.

B — Activity Milestones Module

The activity Milestone Incentives module governs the allocation of on-chain incentives linked to measurable protocol-wide achievements.
Its function is to introduce an **additional layer of participation logic** that aligns protocol engagement with network-level objectives such as sustained on-chain activity and adoption benchmarks.
Milestone events are predefined, quantifiable, and verified through deterministic checks on-chain. The module operates in parallel with the Protocol Incentives Module but activates only when specific network thresholds are met.

a. Milestones Triggering During the initial User Onboarding Phase, a Growth Pool is seeded with a predefined budget dedicated to milestone events.
Each milestone condition (such as network participation or activity thresholds) is verified directly through on-chain state inspection.
Upon successful verification, a corresponding portion of the Growth Pool is released to the DAO Treasury under predefined on-chain rules for subsequent governance processing.
Milestone validation uses **time-weighted averaging** of protocol variables (TWAL/TWAP) to ensure that transient fluctuations cannot trigger unlock conditions.
Only sustained performance across multiple blocks or epochs is recognized as a valid achievement.

b. Governance-Directed Allocation Once milestone resources are released into the DAO Treasury, [Voters] determine allocation within bounded governance ranges.
Possible recipients include:

- [TVL Participants] — suppliers and liquidity users maintaining eligible liquidity positions.
- [Vested $KSKD Holders] — contributors or community members with time-locked allocations.

No automatic routing exists; all distributions follow explicit governance execution within predefined parameters in order to preserve proportionality between milestone magnitude and incentive output.

c. Anti-gaming safeguards

On-chain Verification
Milestone conditions are evaluated entirely on-chain using Solidity-based checks that read protocol storage directly. This eliminates oracle dependence and leverages the EVM's native Patricia Merkle Trie structure for historical state validation.

Time-Weighted Validation
Thresholds rely on Time-Weighted Average Liquidity (TWAL) or Time-Weighted Average TVL (TWAP) calculations to smoothen short-term anomalies and prevent manipulation through temporary inflows of liquidity.
A milestone is confirmed only if the target variable remains above its threshold for a defined validation window across multiple epochs.

Cooldown and Finalization window
After a milestone condition is met, a cooldown period—defined in block intervals or epochs—is enforced before governance confirmation.
In order to neutralize "flash" liquidity tactics and support consistent state validation, values must remain above the threshold for the full cooldown duration.

Eligibility Filters The eligibility filters are here to make sure that milestone distributions correlate with genuine, sustained contributions:

- Only accounts meeting baseline participation criteria (participation, LTV, and uptime) are included in the distribution set.
- Suppliers must maintain at least 90% uptime per epoch (never below 80%), while liquidity users must sustain 50% uptime and the required LTV ratio.

Bounded Governance Control
After milestone verification, the milestone emissions are attested to be proportional to actual protocol performance. The protocol then releases funds to a dedicated Milestone Allocation Pool inside the DAO Treasury.
Disbursement occurs only through governance actions bounded by predefined allocation ranges.

Transparency and Auditability
All milestone conditions, validation windows, and governance allocations are verifiable on-chain. Any participant can reproduce the verification process using public state data, enabling community-level auditability and transparency in allocation outcomes.
On top of this, the Kaskad protocol will provide direct verifiable access via a dedicated public protocol dashboard.

C. Protocol Resource Routing Module

The Protocol Resource Routing module defines how all protocol-generated resources are recorded, routed, and governed. Those resources originate from protocol operations such as Usage Spread Fees, Flash-Loan Fees, and Liquidation Penalty Fees.
Here we present how the Protocol Resource Routing operates as a deterministic framework that separates community-governed incentive allocations from predefined operational resources managed for infrastructure and maintenance purposes.
All routing is handled through smart-contract vaults designed to restrict discretionary modification on chain through immutable vault contracts, ensuring verifiable accounting of protocol resource movements.

a. Fees generation Protocol-level operational parameters ("fees") arise from specific smart-contract actions:

- **Protocol Fees:** A predefined protocol-level parameter is applied to liquidity activity. These resources are routed internally for operational maintenance (e.g., audits, insurance buffers, infrastructure) through the Operational Treasury, and for activity-based incentive mechanics through the DAO Treasury. These parameters do not create any financial rights or returns for tokenholders.
- **Flash-loan Fees:** A fixed fee (e.g., 0.05%) on the notional borrowed and repaid within the same transaction; if repayment + fee isn't allocated atomically, the transaction reverts.
- **Liquidation Penalty Fees:** When a position becomes under-collateralized, a predefined penalty parameter is applied. A portion is allocated to the liquidator to compensate for the execution cost of the liquidation process, and the remaining portion is routed to the Protocol Resource Routing module for internal protocol-maintenance functions.

Protocol usage fees are internal accounting parameters used solely to fund maintenance and incentive functions within the system. They are not distributed as revenue or profit to tokenholders and remain locked in smart-contract vaults governed by non-financial logic.

b. Treasury Structure Kaskad's dual-treasury structure introduces operational separation while maintaining unified protocol functionality.
All protocol-level resource movements, including participation fees and on-chain adjustment events, are processed through two non-discretionary and on-chain enforced smart-contract vaults that form the foundation of the protocol's treasury and governance framework.

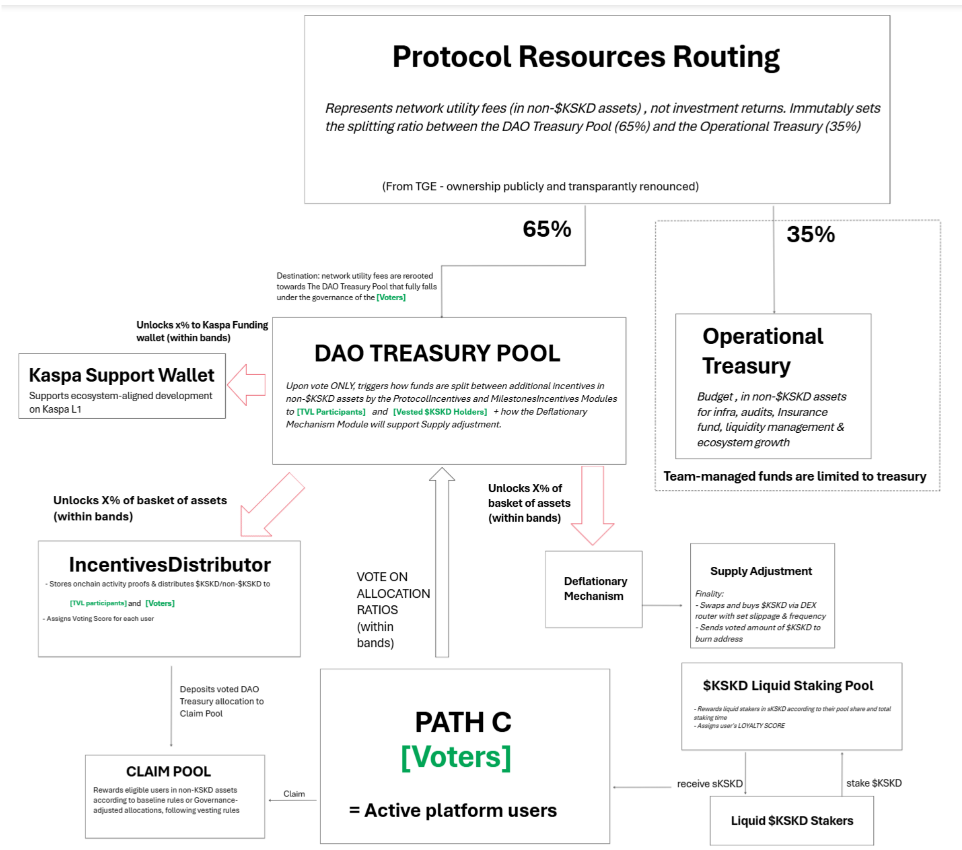

Figure 3:

DAO Treasury Pool (65%)
The DAO Treasury represents the collective on-chain governance module of the protocol. It is governed by [Voters] and functions as the principal mechanism for allocating activity-based resources within the ecosystem.
Its mandate includes:

- sustaining long-term participation incentives through the IncentivesDistributor,
- managing the unallocated $KSKD tokens returned from under-utilized incentive rounds,
- supporting ecosystem-aligned development activities (e.g., Kaspa Core R&D) within predefined non-financial governance parameters,
- executing predefined on-chain supply-adjustment operations within bounded parameters via the Supply Adjustment Mechanism,
- facilitating automated, predefined releases linked to verified milestone events.

The DAO Treasury Pool functions as the central feedback channel between protocol usage and on-chain governance participants, specifically, $KSKD liquid stakers and [TVL Participants] who by behaving so become [Voters] who collectively determine incentive-allocation parameters. Through bounded on-chain governance, this vault allows the [voters] to adjust incentive proportions and parameters according to measurable participation data.
No assets are distributed automatically; all outflows occur under predefined governance procedures and time-locked execution rules.

Operational Treasury (35%)
The Operational Treasury is executed under a predefined on-chain mandate by protocol development contributors, limited strictly to operational expenditures and never involving user funds.
Its mandate covers:

- infrastructure operations across Igra and Kaspa layers,
- maintenance of risk-mitigation reserves,
- audit and security review costs,
- third-party integration, Igra Attester management, and ecosystem partnerships,
- predefined operational reimbursements and resource allocations necessary for maintenance of protocol infrastructure,
- and the technical implementation of upgrades or emergency patches validated through governance.

While the DAO Treasury Pool allocates participation-driven incentives, the Operational Treasury ensures the ongoing functionality, reliability, and scalability of the protocol.
Both treasuries operate under on-chain transparency conditions, with observable balances, transfers, and expenditure categories.
Kaskad's dual-treasury architecture establishes a structural separation between **collective governance** and **operational stewardship**.
Such separation has been designed to make sure that community-based incentive allocations remain governance-directed, while sustainability and scalability functions are executed within predefined administrative mandates.

Despite their distinct mandates, both treasuries operate under a coordinated on-chain framework maintaining functional interdependence and alignment between governance and development within verifiable, bounded parameters.
Interactions between treasuries are unidirectional and hard-coded within the smart-contract logic, non-discretionary and not subject to modification through governance.

c. Anti-Gaming Safeguards The anti-gaming safeguards define operational boundaries for all treasury-level movements and token-supply calibration procedures.
Each safeguard operates through verifiable on-chain logic, preventing discretionary intervention or concentration of control.

Routing and Structural Integrity
All protocol resources are routed exclusively to two non-discretionary, on-chain enforced vaults: the DAO Treasury Pool (65%) and the Operational Treasury (35%).
No third destinations exist, and no direct user disbursements occur outside of governance-approved mechanisms.
Resources in the DAO Treasury Pool remain inactive by default and can move only through governance actions within bounded parameters.
No automatic routing or self-executing distribution is permitted.

DAO Treasury Pool — Spend Controls
The DAO Treasury Pool operates under explicit allocation boundaries to govern the Protocol Resource Routing.
<u>Permitted categories:</u>

- Additional allocations to [TVL participants] may be issued as non-transferable participation receipts recorded in ERC-4626-compatible contracts for accounting and transparency purposes only. These receipts do not represent ownership or redemption rights over any asset basket. They function solely as on-chain records of protocol activity used to calculate subsequent non-financial participation parameters within bounded governance logic. No holder may redeem, exchange, or claim any portion of the underlying protocol resources, and the system provides no right to revenue, profit, or asset distribution.
- Token supply calibration operations through the Supply Adjustment Mechanism,
- Growth Pool top-ups for milestone allocations during the User Onboarding Phase,
- Kaspa Core Funding Wallet, to support Kaspa L1 ecosystem-aligned development activities under predefined, non-financial governance parameters.

DAO Treasury Pool — Bounded parameters

- Incentive allocations from the IncentivesDistributor: base Supplier to Borrower ratio for epoch-based allocations within the 40/60 range.

  Ex: if 10,000 $KSKD are allocated to TVL participants for epoch A, voters can decide to allocate 4,000 $KSKD to Suppliers and 6,000 $KSKD to Liquidity users for the same epoch.
- Protocol Resources Routing allocations to [voters] via the Incentives Distributor: min 50% adjustable up to 80%
- Supply Adjustment Mechanism: min 15%, adjustable up to 20%
- Kaspa Core Funding wallet: minimum 5%, adjustable up to 7.5%

Epoch allocation cap:

$$\text{MaxDAOOut}_t \leq \alpha \cdot \text{DAOBalance}_t$$

with α set at 85%. This limits aggregate outflows within any epoch.
Streaming allocation:
Approved disbursements stream linearly throughout the epoch and remain revocable by follow-up vote. Lump-sum disbursements are disallowed.
Snapshot and vote-lock:
Voting power snapshots occur prior to proposal creation; power remains locked until the voting window closes, preventing last-minute concentration of influence.
Challenge window and timelock:
Each spend proposal includes a 48-hour timelock and a 24-hour challenge window, during which reversal or amendment is possible before execution.
Quorum and supermajority thresholds:
Adjustments to spend caps, large supply-adjustment executions, or new budget categories require a minimum 60% quorum and supermajority approval.

d. Supply Adjustment Mechanism — Supply Adjustment Guards

All supply-adjustment operations are governance-initiated, not automated. Supply-adjustment operations are purely technical balancing functions within the token-emission schedule. They do not involve secondary-market transactions or price-support activity and cannot be used to influence token valuation.
Execution follows structured safeguards:

Execution rules:
Time-weighted average price (TWAP) slicing mechanisms with guardrails preventing execution outside predefined operational bands. Preference for decentralized execution frameworks designed to minimize front-running or transaction-ordering risks.

Size throttling:
The protocol applies limiting-rates so that any single adjustment event remains within 10% of the average protocol activity over the previous 30 days.

$$\text{AdjSize}_t \leq \beta \cdot \text{30dAvgVol}$$

with β fixed at 10%.

Counterparty controls:
Execution restricted to approved venues; affiliated authorized liquidity-maintenance agents require explicit on-chain approval.

Transparency:
Each execution produces pre- and post-operation records (scope, execution path, deviation metrics, block range) stored on-chain or referenced via IPFS.

Operational Treasury — Resource Governance (Limited Scope)

The Operational Treasury operates under a fixed functional mandate covering infrastructure, audits, integrations, and security maintenance. It has no authority for incentive distributions or value extraction. Each quarter, it publishes line-item expenditure reports comparing allocated budgets with realised spending. Dual-control multi-signature (3 out of 6) and annual third-party attestations maintain operational continuity verification.

Emergency and Circuit Breakers

The protocol incorporates emergency mechanisms to preserve functional integrity during periods of instability or anomalous governance behaviour. These circuit breakers are narrowly scoped to halt sensitive operations without disrupting normal protocol participation or liquidity operations. Their activation logic and recovery procedures are executed on-chain and subject to governance review.

- **Panic pause:**

  Temporarily halts new DAO allocations while maintaining full accessibility of user balances and participation functions.

- **Supply-adjustment safeguard:**

  Temporarily pauses supply-adjustment operations when predefined stability parameters are breached.

Governance Capture Mitigation

To safeguard the governance process against short-term influence accumulation or coordinated bribery, the protocol embeds countermeasures that preserve deliberative integrity and time-based fairness. These mechanisms are here to moderate power concentration and introduce temporal friction to any governance manipulation attempt.

- **Time-weighted voting:**

  Voting power scales with participation-lock duration, reinforcing long-term alignment used solely for governance alignment and not linked to financial return.

- **Bribe registry and cooling-off periods:**

  Any disclosed off-platform incentive agreements trigger extended timelocks for the affected proposals, introducing an additional verification window before execution.

D. DAO Treasury Pool

a. Purpose

The DAO Treasury Pool functions as the principal coordination layer for protocol-level resource management. It aggregates all protocol-generated resources originating from activity-based token routing, milestone-triggered releases, utilization-side participation and allocates them through bounded on-chain governance procedures. The treasury operates as an autonomous smart-contract vault deployed at genesis, with parameters codified to prevent discretionary or arbitrary resource transfers.

b. Allocation

By design, the DAO Treasury Pool receives **65% of all protocol-level resources routed through on-chain vaults**, establishing it as the dominant pool for activity-driven allocations and long-term incentive sustainability.Its function extends beyond storage: it serves as the operational hub through which governance actions are executed, and from which governance-approved incentive allocations, ecosystem initiatives, and non-financial supply adjustment processes.

Disbursements from the DAO Treasury Pool occur exclusively through validated governance proposals initiated and approved by [voters]—the cohort of participants who both stake and provide liquidity to the protocol. Each proposal operates within bounded parameters, ensuring that treasury allocations remain proportionate to available balances and that no single epoch can exhaust the pool's reserves. Temporal controls, such as time-locked execution and cooling-off periods, further prevent abrupt or high-risk reallocations.

c. Targets

Resources maintained within the DAO Treasury Pool are segregated into tagged sub-pools representing specific categories of protocol activity. These include the Incentives Distributor (for continuous emission cycling), the Milestone Allocation Pool (for event-based releases), the Supply Adjustment Mechanism (for token supply adjustment within predefined parameters); Kaspa Funding Wallet (to support ecosystem-aligned development activities on Kaspa L1 under predefined non-financial governance parameters) and Protocol Resources Routing (for protocol fee management). All transfers between sub-pools are logged on-chain and executed under verifiable constraints, enabling auditability without reliance on off-chain attestations.

d. Governance

Through this structure, the DAO Treasury Pool establishes a transparent, rule-based governance channel for coordinating the majority of the protocol's on-chain resources. Its objective is not accumulation but regulated allocation: to ensure that all liquidity incentives, growth allocations, and token-supply calibrations remain verifiably aligned with the network's participation dynamics and long-term sustainability, as described in the previous sections.

E. Supply Adjustment Mechanism

The Supply Adjustment Mechanism defines controlled, governance-directed adjustments to the circulating $KSKD amount. It provides a bounded mechanism for calibrating residual emissions, maintaining incentive efficiency, and limiting long-term token expansion while maintaining predictability in token distribution parameters.
No entity, governance participant, or contributor engages in secondary-market trading on behalf of the protocol. All supply-adjustment operations are executed automatically on-chain through predefined rules, exclusively to maintain distribution equilibrium, never for price influence.

a. Scope of Adjustments

This mechanism is not autonomous. All operations are initiated through on-chain governance proposals validated by [voters], ensuring that every adjustment follows a transparent decision path subject to predefined limits. The mechanism acts exclusively on:

- Unallocated $KSKD emissions accumulated within the DAO Treasury Pool, particularly those returned from underutilised liquidity activity pools or unclaimed incentive cycles.
- Protocol Resource Routing directed in the DAO Treasury Pool, where [voters] determine how the 65% Treasury resources are allocated between activity-based incentives and token-supply calibration processes.

b. Bounded ranges

Governance decisions over these allocations are bounded by fixed ratios established at deployment. The framework makes sure that no allocation can remove either the participation-

incentive or the supply-calibration components, preserving consistency between participation incentives and protocol maintenance requirements.
Execution of supply adjustments occurs through time-time-segmented on-chain operations distributed across multiple blocks to avoid concentrated operational impact and ensure consistent execution conditions. Each operation follows deviation and participation thresholds defined at deployment, preventing excessive fluctuation or self-triggering behaviour. Any on-chain interfaces or modules involved in liquidity routing or supply adjustments must be pre-approved and auditable, with all operational data, including block ranges, execution sizes, and final settlement addresses published on-chain.
The Supply Adjustment Mechanism thus functions as a corrective layer within Kaskad's token supply. It maintains the predictability of the emission schedule while granting the governance process measured flexibility to respond to evolving liquidity conditions. By combining bounded control with verifiable transparency, it aligns token distribution with actual protocol usage and participation metrics.

c. Technical Note — Execution Boundaries and Parameters

To maintain predictable behaviour and verifiable transparency, all operations executed under the Supply Adjustment Mechanism are constrained by quantitative and procedural safeguards defined at deployment.

- **i. Execution Cadence and Granularity**

  Each supply-adjustment operation is divided into N equal segments executed across M consecutive block intervals. This segmented execution pattern reduces concentrated operational effects. Transactions are non-overlapping and automatically aborted if block-level conditions deviate from pre-set tolerances.

- **ii. Parameter Boundaries**

  Let At denote the total adjustable amount for epoch t. The effective adjustment limit is defined as:

  $$At \leq \beta \cdot \text{30dAvgVol}$$

  where β is is the throttling coefficient (default = 0.05). This allows us to make sure each operation remains within 5% of the average on-chain transaction activity over thirty days, maintaining protocol stability and balance.

- **iii. Governance and Threshold Controls**

  All proposals invoking supply adjustments must satisfy quorum and supermajority thresholds defined in the governance layer. Parameters such as β, timelocks, and spend caps are modifiable within fixed governance ranges but cannot be lowered below the protocol-defined floors (e.g., $\beta_{min} = 0.05, timelock \geq 48h$).

- **iv. Transparency and Verification**

  Execution data (including operation size, execution path identifier, and destination address) is automatically logged and made publicly verifiable. Records are stored on-chain and indexed via IPFS for independent auditability. Any discrepancy between executed and approved parameters automatically triggers a protocol pause on subsequent operations until reviewed by governance.

IV. Governance Architecture

The Kaskad governance framework establishes a verifiable, on-chain system for collective decision-making. Its objective is to distribute governance influence in proportion to measurable on-chain protocol participation, in a way that decision-making authority derives from active protocol engagement, rather than passive token holding.
Governance actions are performed by entities identified as [voters], defined as participants who simultaneously maintain an active protocol position (supply and/or borrow) and a liquid-staked $KSKD balance. The resulting governance structure integrates three quantifiable participation components: TVL participation, liquid staking, and active voting behaviour.

1) Voting Power and Eligibility

a. Eligibility

A participant qualifies as a [voter] when the following conditions are simultaneously met:

- **Active Liquidity Position**

  The participant maintains a valid participation position (supply or borrow) satisfying the qualification as a [TVL Participant] as defined by the Protocol Incentives.

  This condition certifies that decision-making power remains tied to active protocol usage and operational participation.

- **Liquid Staking Commitment**

  A portion of $KSKD must be deposited in the liquid staking pool.

  Staked positions remain transferable within the protocol environment but are non-withdrawable during active voting epochs.

  The proportional stake value contributes to the participant's Loyalty Score, which compounds across time.

- **Governance Activity Record**

  The cumulative total of validated votes across all epochs contributes permanently to the participant's overall Voting Score, reflecting long-term governance consistency.

b. Voting Power

If the eligibility conditions are met, the Voting power V_p at epoch t is:

$$V_p = \lambda_1 \cdot TVL_{p,t} + \lambda_2 \cdot (Stake_{p,t} + \phi \cdot \sum Votes_p)$$

where $TVL_{p,t}$ is the participant's normalized utilisation contribution during epoch t; $Stake_{p,t}$ is the participant's share of the liquid-staking pool during epoch t; and $\sum Votes_p$ is the cumulative count of validated votes cast by the participant since epoch 0. Coefficients λ_1, λ_2, and ϕ are fixed protocol parameters.
Governance power in Kaskad is limited strictly to parameter adjustment within the protocol. It does not entitle participants to share in revenue, treasury assets, or any form of financial benefit.
Staking affects voting power only as a time-based commitment metric. It confers no financial or yield rights and does not entitle participants to any economic benefit beyond governance participation.

c. Clarification of time scopes

$TVL_{p,t}$ and $Stake_{p,t}$ are epoch-scoped measurements and are **recomputed each epoch** from on-chain state. $\sum Votes_p$ is **lifetime-cumulative** and does not decay.
Each [voter] possesses a composite Voting Score (VS) calculated as:

$$VS = TVL^{(t)}_{score} + Loyalty^{(\Sigma)}_{score}$$

where:

- $TVL^{(t)}_{score}$ measures the participant's proportional contribution to protocol liquidity. It aggregates :
  - The amount and duration of supplied assets, weighted by uptime
  - The amount and duration of utilized assets, with a multiplier applied to participants who both provide and use liquidity simultaneously
  - The participant's relative share of the total TVL during each epoch.
- $Loyalty^{(\Sigma)}_{score}$ measures sustained governance alignment. It is derived from :
  - The participant's share of the liquid staking pool per epoch
  - The total number of validated votes cast by the participant since epoch 0, accumulated over time

Scores are updated at the conclusion of each epoch and stored as on-chain state variables. Our design eliminates the need for off-chain attestations and provides the necessary proof that voting influence reflects ongoing protocol participation and governance engagement.
Governance proposals are initiated and executed through the protocol's bounded governance layer, where all modifiable parameters are constrained within fixed, on-chain encoded ranges defined at contract deployment. This structure prevents any proposal from unilaterally altering emission rates, incentive floors, or treasury allocation limits beyond the predetermined boundaries.
Through this layered scoring and bounded control framework, Kaskad achieves a governance architecture where decision-making authority is a direct function of measurable, sustained participation in protocol operations.

2) Bounded Parameter Logic, Safeguards, and Snapshot Mechanics

a. Parameter Boundedness and Governance Logic

Kaskad's governance model is designed around bounded parameterization, a method that fixes explicit upper and lower limits for key protocol parameters.
Each adjustable parameter is encoded at deployment with contract-defined floor and ceiling constraints, allowing governance to modify protocol behaviour within those margins without risking destabilization or governance misuse.
Boundedness is enforced directly at the contract level. Proposals that attempt to set parameters outside their permitted intervals revert automatically, guaranteeing that even if governance consensus shifts, systemic safeguards remain intact.
The following parameters are defined as adjustable within bounded ranges:

- Supplier deposit: adjustable ±15 %, but never below $100.

- Supplier uptime: adjustable ±2.5 %, but never below 80 %. Default Uptime ratio at TGE: 90%
- Borrower loan-to-value (LTV): adjustable ±5 %, but never below 15 %.
- Borrower uptime: adjustable ±5–10 %, but never below 50 %.
- Emission split ratio between suppliers and liquidity users: bounded 40–60 %

  Ex: if 1,000,000 $KSKD are to be allocated for the upcoming epoch, due to less demand from liquidity users, [voters] can decide to allocate 40% (= 400,000 $KSKD) to suppliers and 60% of the remaining emission (= 600,000 $KSKD) to liquidity users for the same epoch to increase liquidity users adoption of the protocol.
- Protocol Resources Routing allocations to Kaspa Core Support Wallet: adjustable ± 50% but never below 5%

  Ex: if 100,000$ worth of protocol fees have been routed to the DAO Treasury during epoch A, [voters] can decide to allocate up to 7.5%= 7,500$ to the Kaspa Core Funding Wallet that will be distributed after conclusion of the vote to the corresponding receiving wallet address from Kaspa Devfund.
- Reallocation of unused emissions between Incentive Distributor and Supply Adjustment Mechanism: bounded 35–65 %.

  Ex: if 10,000 $KSKD were not claimed during epoch A due to less demand from liquidity users, [voters] can decide to allocate 40% of this unused emission (= 4,000 $KSKD) to [TVL Participants] for the next epoch, and 60% of the remaining unused allocation (=6,000 $KSKD) to be sent to the Supply Adjustment Mechanism.
- Supply Adjustment size cap: limited to 5 % of the 30-day average market activity.

b. Safeguard Architecture

All governance operations affecting parameter states follow a **multi-stage verification pipeline**: proposal submission, timelock enforcement, and optional challenge window.
Timelocks (minimum 48 hours) prevent immediate execution, while the challenge period (24 hours) allows counter-proposals or revocation if inconsistencies are detected.
All governance data are stored on-chain, making proposal history, voting participation, and parameter revisions publicly auditable.
The safeguard architecture thus acts as both a procedural and transparency layer, maintaining deterministic rule-execution across epochs.

c. Snapshot and State Finalization

Voting snapshots are captured at the block height preceding each proposal's creation. Voting power is locked until the proposal concludes, preventing short-term stake accumulation or flash-voting behaviour.
Once a proposal is finalized and executed, all updated parameter states are permanently recorded in contract storage and reflected in the epoch transition data for traceability. By doing so, all parameter changes are based on verified governance stake positions at the time of proposal creation, maintaining consistency between on-chain state, voting weight, and subsequent incentive distributions.

V. Roadmap

1) 2025-2026 Milestones and Planned Features

a. Testnet and Closed Mainnet Launch Phases

The Q4 2025 cycle is structured around the progressive deployment of the Kaskad protocol on the Igra Layer 2.
A dedicated testnet environment is scheduled to validate protocol lending logic, epoch-based emission mechanisms, and treasury routing behaviour.
Following testnet verification, a closed mainnet phase is planned to operate under restricted access, enabling controlled liquidity introduction and continuous monitoring of governance-bounded parameters before opening to the wider network.

b. Oracle V1 Integration

The first operational version of the Oracle module is planned for integration during this period. This initial implementation combines a TEE-based data ingestion layer with a composite anomaly detection metric developed under the supervision of Eliott Mea.
Kaskad's Oracle V1 is designed to establish a baseline for future decentralized, verifiable reference-data aggregation and will support collateral valuation and liquidation triggers within the lending framework.

c. Bounded Governance Activation

Governance activation is scheduled as a progressive process, beginning with restricted participation and expanding toward full [voter] involvement.
During this phase, bounded governance parameters are tested in production, and treasury routing transitions from fixed configurations to on-chain proposals validated by the DAO. This marks the functional shift from a developer-guided structure to a self-governing coordination model.

d. Security Audit

An independent security audit of Kaskad's smart contract suite has been initiated in Q1 2026 with the Sherlock audit firm, well known in the DeFi sector for auditing projects such as AAVE V4, Morpho, 1Inch. It is scheduled for completion prior to public mainnet deployment. The audit scope covers core lending logic, the bounded governance module, treasury routing contracts, incentive distribution mechanics, and oracle integration interfaces.
Audit findings and remediation status will be published upon completion to ensure transparency. Additional security reviews and formal verification efforts are planned as part of ongoing operational expenditures funded through the Operational Treasury.

2) 2026 Roadmap

a. Expanded Protocol Participation and Public Mainnet

The 2026 phase is expected to expand protocol participation beyond the initial asset pair (iKAS/USDC).
Additional participation pools are planned to include both Kaspa-native and bridged units, extending the framework for multi-network interaction and utilization.
The public mainnet deployment is intended to open participation to all eligible users under the same bounded governance and safeguard architecture validated in the closed environment.

b. Oracle R&D and V2 Deployment

Research activities will focus on the development of the next version of our Oracle solution. The V2 will focus on strengthening data verifiability, minimizing dependency on individual TEE clusters, and introduce modularity for integration with other Kaspa-based protocols requiring authenticated network data.

c. Investigated Features

Future development efforts will focus on enhancing user safety and automation within the protocol architecture. The following mechanisms are scheduled for research, testing, and potential integration during the 2026 cycle:

- **Automated Repayment System**

  A contract-level safeguard designed to mitigate position-risk during rapidly changing protocol level conditions.

  When monitored parameters approach the protocol-defined safety threshold, the system automatically reduces exposure by reallocating collateral within predefined parameters. This function preserves the user's position within predefined collateralization limits without requiring manual intervention.

- **Dynamic Collateralization Ratios**

  Users will be able to set adjustable over-collateralization levels ranging from 200% to 500%, providing an adjustable buffer against changes in protocol-defined collateralization indicators.

  The interface design envisions a "Low-Risk Mode" selection through which users can toggle predefined collateralization tiers, with corresponding visual and numerical indicators of position health.

- **Automated Re-Collateralization System**

  An optional feature enabling users to pre-fund additional collateral that can be automatically deployed to reinforce positions if LTV ratios deteriorate.

  The mechanism is intended to operate natively within the protocol's position management contracts, extending the protective logic of the automated repayment system.

3) Long-Term: Kaspa L1 Expansion Path

Kaspa's base layer is undergoing a progressive expansion in programmability through a series of consensus upgrades: covenants (KIP-10, KIP-17), lineage-based state authentication (KIP-20), and ZK verification opcodes (KIP-16). Together, these primitives form the foundation for vProgs, a verification-oriented programmability layer enshrined in Kaspa L1 that enables off-chain execution with on-chain proof verification.

Kaskad is actively monitoring this development trajectory. The protocol's long-term roadmap includes evaluating a vProgs-adapted implementation of Kaskad's lending and governance logic as the L1 framework matures toward production readiness.

Benefits for Kaskad and Kaspians. A native L1 deployment would eliminate dependency on intermediary execution layers, anchor all protocol state directly to Kaspa's PoW consensus, and align Kaskad with Kaspa Core's vision of a monolithic, composable L1 ecosystem. It would also position Kaskad's oracle integration to benefit directly from the real-time decentralization (RTD) properties that high-BPS consensus provides for miner-attested price feeds.

What Kaskad requires from vProgs. Kaskad's architecture involves complex, multi-module interactions: lending pools must coordinate with liquidation engines, incentive distribution must

reference governance parameters, and treasury routing must execute atomically across multiple contracts. This level of composability requires synchronous cross-program interaction, a capability that is part of the vProgs v2 design but is not yet available in production. Standalone, non-composable covenants are insufficient for a protocol of Kaskad's complexity as of today.
Current approach. Kaskad's deployment on Igra provides a functional, EVM-compatible execution environment that supports the full protocol stack today. This is consistent with the broader Kaspa ecosystem's characterization of based L2 rollups as "proto-vProgs" that will converge with L1 programmability as the tooling matures. Kaskad's EVM-based architecture is designed to be portable, and core lending logic, governance parameters, and treasury routing can be re-implemented on alternative execution environments when they offer sufficient expressiveness.
Expansion conditions. An expansion to vProgs would be evaluated once the following conditions are met:

- vProgs v2 supports synchronous composability between multiple programs.
- A mature ZK stack (Cairo, SP1, or equivalent) is selected and production-hardened for Kaspa.
- Developer tooling and audit infrastructure exist for complex DeFi deployments on vProgs.
- Independent security review confirms that the vProgs environment meets the safety requirements for a lending protocol managing user collateral.

Until these conditions are satisfied, Igra remains Kaskad's primary execution environment, and all protocol development continues on EVM-compatible infrastructure.

VI. Ecosystem and Partnerships

1) Kaspa Layer 1 and Settlement Context

Kaskad operates on infrastructure designed to interoperate with the Kaspa network. While Kaskad does not modify Kaspa's L1 protocol, it benefits from the sequencing model and the blockDAG environment in which Igra Labs' layer is deployed.
Kaspa L1 provides predictable settlement ordering and rapid confirmation finality, supporting high-throughput operations without requiring trust assumptions beyond the base protocol.

2) Kaspa Layer 2: Igra Labs

Kaskad is deployed on Igra, a Kaspa-aligned execution environment providing EVM-compatible smart contract capabilities.
Igra's architecture enables contract-level computation while maintaining direct state anchoring and settlement references to Kaspa. This structure allows Kaskad to perform protocol-level safeguards (e.g., position management and parameter adjustments) with deterministic state visibility and without intermediary bridging layers.

3) Partner Infrastructure: ForYield

ForYield is a compliant digital platform operating within the European Union under applicable virtual-asset registration and MiCA-aligned standards.
The platform provides the infrastructure used to facilitate Kaskad's presale onboarding, including KYC/AML processing, identity verification, presale registration workflows, and claimable allocation tracking.

ForYield operates independently as a MiCA-aligned compliance interface. It does not intermediate, hold, or distribute crypto-assets on behalf of participants, and no funds are ever held by Kaskad or ForYield for investment purposes.

Key functional contributions:

- Secure user onboarding and compliance screening
- Secure technical environment for presale participation and allocation monitoring
- Transparent auditability of participation records up to TGE

As of Q4 2025, ForYield processes registrations for more than €10M equivalent in user participation records (non-custodial, non-investment), and provides compliant infrastructure for Web3 project onboarding. Participation records processed through ForYield are provable and can be reconciled on-chain upon token generation.

VII. Team and R&D Department

Kaskad's implementation and research efforts are carried out by a multidisciplinary team combining distributed systems engineering, applied cryptoeconomics, smart contract security, and market structure research.
Token issuance and operational development are conducted by POW Incentives S.A. (BVI).

Founding Team :

Eliott Méa — Lead Oracle Architect
Research background at ETH Zürich under the supervision of Yonatan Sompolinsky, specializing in decentralized market structure and trustless oracle design. Leads the design and formal verification of Kaskad's Oracle V1 and V2 models.

Julien Daubert — Chief Technology Officer
Distributed systems engineer and founder of 10h11. Responsible for protocol implementation, contract architecture, and cross-layer integration across Igra and Kaspa settlement layers.

Quentin Hopp — Chief Partnership Officer
Responsible for institutional partner development, ecosystem coordination, and liquidity acquisition programs. Background in infrastructure-layer partnerships and platform growth.

Anton Kozlov — Smart Contract Architect
Senior developer with 12+ years in embedded and privacy-first distributed systems. Responsible for core contract suite implementation, gas optimization strategies, and security-critical logic paths.

Marius Ortiz — Product & UX Engineering
Lead contributor to interaction design, client workflows, and platform usability. Focused on minimizing operational complexity for end-users of lending and liquidity activity interfaces.

Pierrick Barnes — Backend Systems Engineer
Developer with more than a decade of experience in scalable backend architectures. Supports execution layer integration, indexing infrastructure, and system performance.

Jack Bagayoko — Chief Operating Officer
Product and protocol strategist with experience in DeFi systems and incentive structure design. Oversees governance logic, tokenomics implementation, operational rollout, and stakeholder coordination.

Core Team and Applied Research :

Yuliya Krikunova — Smart Contract Engineer
Research and development on contract-level parameterization, upgrade pathways, and interaction interfaces. Master's in Financial Systems.

Rémi Khani — Applied Researcher (Tokenomics & Game Theory)
Designs allocation, incentive, and equilibrium mechanics to support sustainable TVL formation and stable market behavior.

Paul Colagrande — Research Collaborator (Market Microstructure and Trading Systems)
Contributes on algorithm, data visualisation and parameter modeling for Kaskad's Oracle models.

VIII. Legal Disclaimer

The following disclaimer applies to the entire Kaskad Whitepaper, any associated materials, including but not limited to tokenomics charts, technical documentation, marketing content, and the $KSKD native token used within the protocol. All participants, users, and readers are required to review these terms carefully before engaging with the protocol.

1) No Financial Services or Intermediation

Kaskad and its affiliated entities do not intend to provide banking, custodial, investment, or other regulated financial services. The protocol operates as a decentralized, non-custodial infrastructure under an open-source technology layer, enabling activity-based interactions among participants and directly with smart contracts for automated on-chain liquidity routing.

2) Technology Provider Only

Kaskad is a software protocol deployed on decentralized infrastructure. It provides coordination logic for suppliers, liquidity users, and governance participants. No central entity provides intermediation, custody, or discretionary control of user funds. All transactions are executed directly by users on the blockchain at their sole discretion. Kaskad has no control over user actions, investment choices, or protocol outcomes and does not engage in brokerage, portfolio management, or any regulated financial intermediation activity.

3) No Investment Advice

Nothing in this whitepaper or associated materials constitutes financial, legal, tax, or investment advice. No representation is made that participation in the Kaskad protocol is suitable for any specific individual or entity. Participants are solely responsible for their decisions and bear all risks associated with their activity. The information provided is strictly educational and descriptive of the functioning of the protocol. You should conduct your own independent analysis and seek professional advice before engaging in any activity related to the Kaskad Protocol or the $KSKD token.

4) No Offer or Solicitation

This document does not constitute an offer to sell, solicitation to buy, or invitation to purchase or sell securities, financial instruments, or regulated products in any jurisdiction. No part of this document shall be construed as an invitation to invest, subscribe, or participate in any profit-sharing or revenue-generating activity. The $KSKD token is intended to function as a utility token, enabling governance and incentive participation within the Kaskad ecosystem and shall not be offered or sold to individuals in jurisdictions where such activity would be unlawful.

5) Utility Token Classification

The $KSKD token is designed as a utility and governance token under the EU Markets in Crypto-Assets Regulation (MiCA) framework and provides holders with access to protocol functionalities such as governance participation and the ability to engage in activity-based incentive mechanisms. $KSKD does not represent ownership, equity, debt, or any right to revenue, dividends, or profit participation in Kaskad or any affiliated entity. The token is not intended to constitute a security, financial instrument, or e-money token under applicable EU or Member State laws, and it does not provide dividends, profit-sharing, ownership rights, or claims on revenue. All uses of the token are activity-based, capped, and bounded by transparent protocol logic. Incentives are participation-based, not entitlement rights.

6) No Guarantee of Regulatory Approval

Kaskad aims to operate in alignment with MiCA and other applicable regulations and makes no guarantee that the protocol or $KSKD token will receive regulatory approval in any jurisdiction. Regulatory frameworks for crypto-assets are evolving, and future developments may impact the interpretation, availability, or functionality of the protocol or its tokens. Participants are responsible for understanding and complying with local laws and regulations applicable to their activities.

7) Jurisdictional Restrictions

Access to the Kaskad protocol and $KSKD token may be subject to restrictions under local laws. Individuals or entities located in jurisdictions where participation would be unlawful or require prior authorization are prohibited from engaging with the protocol. Kaskad disclaims all responsibility for violations of such restrictions by users. It is the sole responsibility of each participant to ensure compliance with applicable legal and regulatory requirements.

8) No Liability & Risk Acknowledgment

Participation in decentralized finance activities, including those facilitated by Kaskad Protocol, involve significant technological and financial risks, including but not limited to market volatility, technical risk such as smart contract vulnerabilities, governance risks and regulatory uncertainty. The protocol contributors, developers, and associated entities disclaim liability for any losses arising from use of the protocol or $KSKD token. Users acknowledge that they engage at their own risk and acknowledge that by using the Kaskad Protocol or acquiring $KSKD tokens, they accept that use at their own risk. Kaskad, its team, and affiliates shall not be liable for any direct, indirect, incidental, or consequential losses arising from the use of the protocol or reliance on this document.