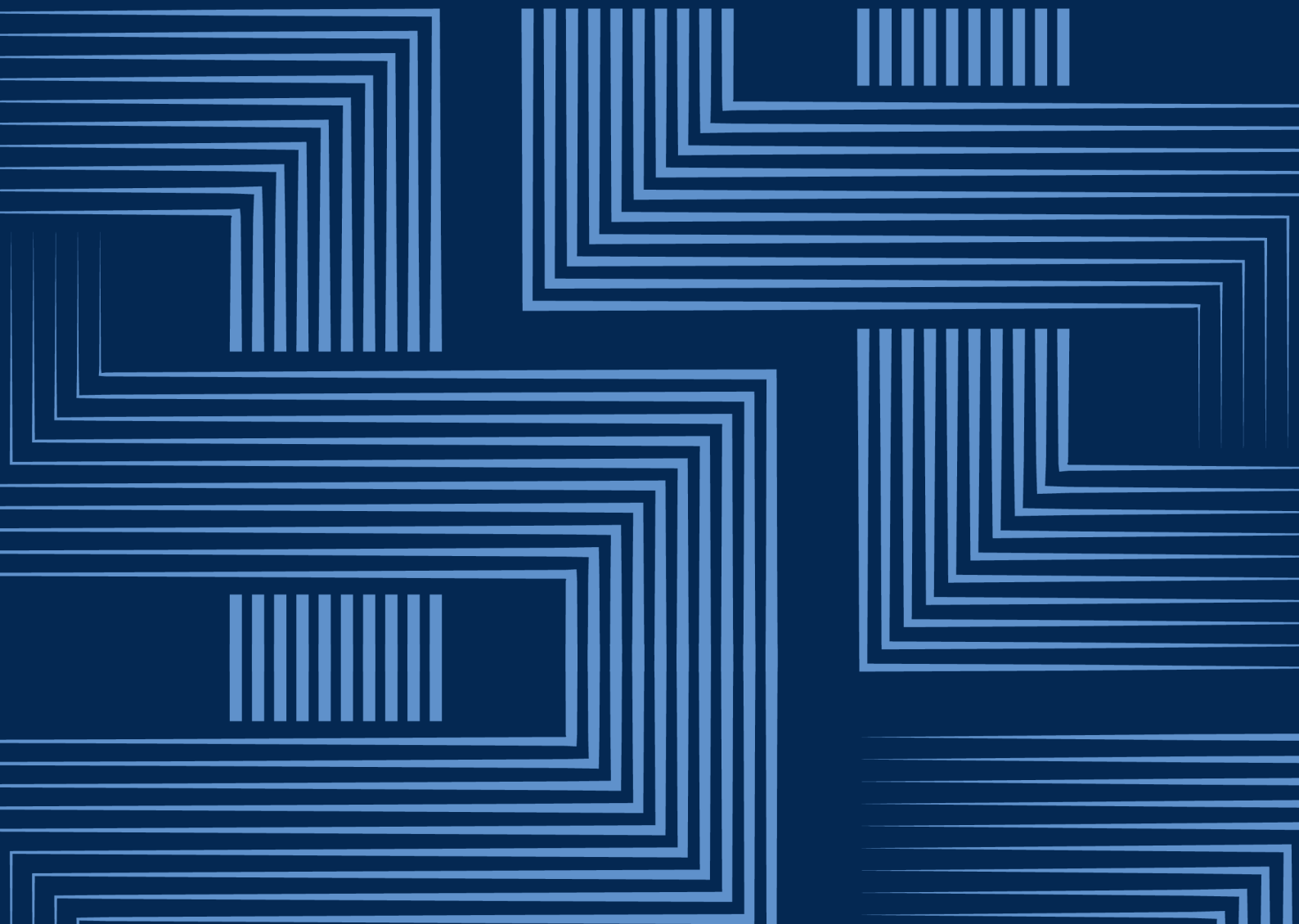
LITE PAPER

# Kaz Smart Chain

## A Sovereign Multichain Supernode Architecture for Digital Kazakhstan

Syrym Serikov Serzhanuly



**Abstract**
Kazakhstan faces a strategic imperative: securing its digital future through sovereign blockchain infrastructure. KazSmartChain (KSC) is introduced as a multichain supernode — a national platform designed to keep critical Web3 services under Kazakh control while remaining connected to global networks. This litepaper sets out the context and justification for the project. It draws on Kazakhstan's digital transformation agenda, including the Digital Kazakhstan program, the ongoing Digital Tenge initiative, and the President's 2025 directive to establish a national digital asset ecosystem. Together, these initiatives highlight the need for a sovereign blockchain backbone.

Kaz Smart Chain aims to:
- Bolster digital sovereignty.
- Secure and localize data jurisdiction.
- Integrate decentralized technologies into e-government and financial systems.

Built on a network of high-performance validator nodes located in Kazakhstan, KSC aims coordinates both public and private blockchains within a unified framework. This ensures the innovation and transparency of blockchain technology are combined with the oversight and policy alignment of sovereign governance.

In this way, KSC positions itself as a foundational layer for Kazakhstan's next stage of digital development — aligning with national priorities of technological self-reliance, financial innovation, and trusted digital infrastructure.

Prepared by
Syrym Serikov

Reporting Period
October 1, 2025

# Table of Contents

# Introduction

Kazakhstan is entering a decisive stage in its digital transformation, where control over core digital infrastructure has become a matter of national sovereignty. Around the world, governments are recognizing that Web3 technologies — blockchains, digital assets, and decentralized applications — carry both opportunities for innovation and risks of dependence on foreign systems. Kazakhstan is no exception.

The country's Digital Kazakhstan program (2018–2022) built the foundation: broadband expansion, digital public services, and early blockchain integration. These efforts placed Kazakhstan among the global leaders in e-government adoption. Yet rapid involvement in global crypto markets also revealed vulnerabilities, including reliance on external networks and unregulated activity.

In response, policymakers have advanced ambitious initiatives:

- Digital Tenge (CBDC): piloted for public finance transparency.
- Law on Digital Assets (2023): bringing cryptocurrencies under regulation.
- Presidential Directive (2025): mandate to create a comprehensive digital asset ecosystem, including a State Digital Asset Fund and a regulated "CryptoCity" in Alatau.

These actions converge on one strategic theme: digital sovereignty

KazSmartChain (KSC) emerges as the proposed backbone of our vision. Designed as a multichain supernode architecture, KSC would unite public and private blockchains under Kazakh governance, ensuring compliance with domestic law while maintaining global interoperability. High-performance validator nodes, operated by national institutions, would anchor the system — combining innovation, transparency, and sovereign control.

Similar to Japan's "Japan Smart Chain" or European sovereign blockchain debates, Kaz Smart Chain represents Kazakhstan's model: a platform built not only to participate in Web3, but to shape it on Kazakhstan's own terms.

# Problem Statement

While global blockchains like Ethereum Bitcoin or Solana offer innovation, they are not designed to serve as national infrastructure. For Kazakhstan, relying on foreign networks introduces five critical risks:

**Regulatory Fragmentation**
Transactions flow across dozens of jurisdictions, leaving Kazakh regulators uncertain which laws apply. This undermines financial oversight, taxation, and consumer protection.

**Loss of Data Sovereignty**
National data can end up stored on servers abroad, beyond Kazakh control. Foreign entities could impose sanctions, censorship, or protocol changes that affect Kazakh users without local input.

**Governance Dependence**
Protocol upgrades, fees, and consensus rules are decided by external developers and communities. Kazakhstan has no guaranteed service levels or ability to customize rules for its needs.

**Transparency Gaps**
Today, 90% of Kazakh crypto activity takes place offshore. Authorities lack visibility into flows of value, which limits AML oversight, taxation, and financial security.

**Integration Barriers**
E-government platforms, Digital ID, and the Digital Tenge cannot easily integrate with global blockchains due to legal and technical incompatibilities.

**Why Sovereign Control Matters**
A Kazakh-controlled blockchain resolves these risks. By hosting validator nodes under Kazakh jurisdiction and aligning consensus rules with national priorities,

Kaz Smart Chain can:

- Ensure legal accountability and compliance with domestic law.
- Localize and protect critical data.
- Provide built-in transparency for financial monitoring.
- Seamlessly integrate with national digital services.

In this sense, a sovereign blockchain is not optional — it is a strategic infrastructure investment, on par with energy grids or telecom networks, ensuring Kazakhstan's digital future remains secure and self-reliant.

# Comparative Overview of Blockchain Infrastructures

The table below summarizes how leading blockchain platforms compare across key dimensions of sovereignty, governance, interoperability, and performance. This highlights why Kazakhstan requires its own sovereign approach.

| Blockchain Platform | Consensus Mechanism | Governance | Sovereignty Jurisdiction | Perfor - mance | Intero- perability | Suitable for National Use? |
|---|---|---|---|---|---|---|
| **Ethereum (public)** | Proof-of-Stake, ~4400+ validators | Informal off-chain, dev + community consensus | Global, no state control | ~15 TPS, finality ~6–12 min (scaled via L2s) | EVM Bridges | Lacks sovereignty |
| **Solana (public)** | Delegated PoS + Proof-of-History | Foundation-driven, centralized influence | Global, infra concentrated | 2k–3k TPS, sub-second latency | Bridges (e.g. Wormhole) | Not sovereign, prone to outage |
| **Japan Smart Chain (JSC)** | Permissioned PoS, 21 domestic validators | JSC Foundation consortium | Japan-only, under JP law | Ethereum-like throughput, 6s blocks | EVM compatible, bridges | Designed for Japan's national use |
| **Hyperledger Fabric** | BFT consensus, no token | Consortium-set rules | Full jurisdictional control | 2k+ TPS, 1–2s finality | App-layer or Cacti bridges | Strong for government / enterprise |
| **TON** | Proof-of-Stake with BFT consensus | On-chain validator voting | Global / multi-jurisdiction | ~104,000 TPS tested, ~1–5s blocks | Bridges (e.g. Axelar) | Potential, but not sovereign by default |
| **BNB Chain** | Proof-of-Staked Authority | On-chain governance via DAO | Global, with influence by community | ~225 TPS block time ~0.75 s, finality ~2 s | EVM-compatible bridges, cross-chain | Partially — scalable but lacks full sovereignty |
| **R3 Corda** | Notary-based validation | R3 consortium + licensed participants | Deployed within specific jurisdictions | High throughput, immediate finality. | Limited; focused on API/enterprise integration | Yes, used for CBDC projects |

## Synthesis:

# Positioning KazSmartChain for Digital Sovereignty

KazSmartChain builds on global blockchain lessons while adapting to Kazakhstan's unique needs. Existing models show a spectrum: open global networks (Ethereum, BNB Chain, Solana), sovereign chains (Japan's JSC), and state-driven platforms (China's BSN). KazSmartChain takes a hybrid path — sovereign, interoperable, high-performing, and sustainable.

### Key Principles:

**Sovereignty & Governance:** Validators are based in Kazakhstan, bound by domestic law. Governance is federated across ministries, banks, universities, and enterprises, ensuring transparency and compliance without over-centralization.

**Interoperability:** Designed to integrate with Kazakhstan's digital ID, e-government, and the Digital Tenge, while also connecting to global blockchains through standard protocols.

**Performance:** Built for scale — thousands of TPS and second-level finality, using modern PoS/BFT consensus. Sector-specific zones (finance, public records, logistics) ensure resilience and scalability.

**Sustainability:** Energy-efficient consensus ensures low carbon footprint. The network can support ESG use cases such as carbon credit trading and renewable energy certificates.

### Strategic Position:

Kaz Smart Chain is neither fully permissionless nor fully closed. It is a public–private sovereign ledger: open for use by citizens and businesses, but governed by trusted national institutions. In doing so, it combines the transparency of global blockchains with the accountability of state oversight — positioning itself as critical digital infrastructure for Kazakhstan's sovereignty and innovation.

# Proposed Solution: Vision and Architecture

Kaz Smart Chain can be Kazakhstan's answer to the challenge of building a sovereign, secure, and scalable blockchain infrastructure. It is conceived as a multichain supernode: a platform that unifies multiple blockchain protocols under one national framework, hosted entirely within Kazakhstan's jurisdiction.

**Open Innovation:**
Open-source architecture encourages developers, startups, and academia to build on top.

## Guiding Design Principles

### Sovereignty

All validators and data centers are located on Kazakh soil, ensuring full jurisdictional control.

### Regulatory Alignment

Compliance with Kazakh law (AML/KYC, data privacy, NBK standards) is embedded at the protocol level.

### Interperoability

Built to connect different blockchains and integrate with national systems (Digital Tenge, e-government, digital ID).

### Efficiency: and Scalability:

Uses energy-efficient consensus (PoS/BFT), avoiding the energy burden of proof-of-work. Supports thousands of TPS with sector-specific zones for finance, government, and citizen services.

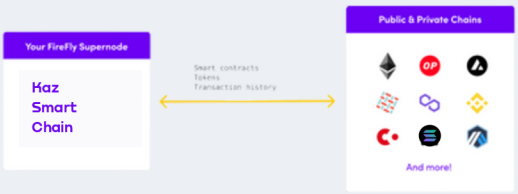
### Institutional Trust and Resilience

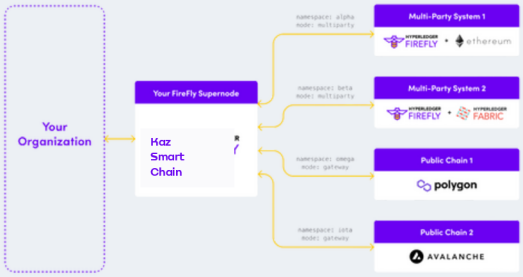
All validators and data centers are located on Kazakh soil, ensuring full jurisdictional control. Operates on sovereign cloud infrastructure, ensuring continuity even in case of external shocks.

# Multichain Supernode Architecture

At the core of KazSmartChain is a supernode orchestration layer (FireFly API) that connects applications to multiple blockchains in one seamless environment. Each chain serves a specific role:


- **Ethereum (Besu):** Smart contracts, token standards, and broad developer compatibility.
- **Hyperledger Fabric:** Private, high-throughput networks for government and enterprise consortia.
- **R3 Corda:** Finance-grade infrastructure for regulated digital assets and inter-bank settlement.
- **Solana:** High-performance layer for large-scale applications and retail services.
- **FireFly Layer:** The “nervous system” that enables cross-chain workflows, digital ID integration, and API access for developers.




All components run within Kazakhstan’s sovereign cloud and data centers, secured by national cybersecurity standards and governed by a consortium of public and private stakeholders.

# Use Cases & Applications

KazSmartChain (KSC) delivers tangible value across government, business, and citizen services, directly supporting Kazakhstan's Digital Kazakhstan agenda, the rollout of the Digital Tenge, and the President's 2025 Address. By operating as a shared sovereign infrastructure, KSC creates trust, transparency, and efficiency at national scale.

## Public Sector

- **Transparent Public Finance:** Smart contracts on KSC ensure that every tenge of public spending is traceable, reducing corruption and improving accountability.
- **Land & Resource Registries:** Property titles, land cadastres, and resource licenses stored on-chain provide tamper-proof records, supporting efficient allocation and transparent governance.

## Private Sector

- **Digital Finance & Tokenized Assets:** Banks and fintechs can issue and trade stablecoins, tokenized commodities, and securities within a regulated, sovereign framework.
- **Supply Chain & Logistics:** Real-time blockchain tracking of shipments strengthens Kazakhstan's position as a trusted Eurasian trade hub.
- **Sustainability & ESG:** Carbon credits, mining outputs, and agricultural produce can be tokenized to meet global ESG reporting and export standards.

## Citizen Services

- **Self-Sovereign Digital Identity:** Citizens hold secure, portable digital IDs and credentials, reducing bureaucracy while preserving privacy.
- **Targeted Social Payments:** Benefits and subsidies issued in Digital Tenge on KSC are programmable and traceable, ensuring fairness and accountability.
- **Verifiable Credentials:** Diplomas, licenses, and certificates are issued on-chain, simplifying verification for employers and institutions.

# Partner Specific Use Case 1: Jasaim Blockchain Project

**Jasaim Blockchain** is a secure and transparent digital infrastructure that prevents credential fraud, streamlines academic processes, and enables global recognition of diplomas. Using blockchain and smart contracts, it ensures trusted, tamper-proof records while protecting user privacy.

## Distinct Value Propositions

1. **Fraud-Proof Academic Records** – Ensures transparent, tamper-proof tracking of students achievements.
2. **Streamlined Education & Career Processes** Simplifies university registration, document exchange and graduate onboarding
3. **Global Credential Recognition.** Enables seamless cross-border diploma verification via a blockchain consortium.

## It has 4 components

Life Long Learning Passport

Data as Service For Empolyers

Jas Wallet Neobank

Infrastructure as service for Governments

## Jasaim Blockchain is foundation for building Fintech Superapp for Education with Learn to Earn Module tied to blockchain

**Jas Wallet**
Fintech Neobank
For Education

Proof of Concept:

## We emerged as a pioneer and leader in the integration of blockchain technology within the educational sector of Central Asia.

**3000+**

### Diplomas

Diplomas awarded to graduates of bachelor's and master's programs from KBTU, Satpayev University, and the Almaty General Plan.

**325**

### Employers

Employer profiles have been established on the portal for graduates to submit their applications.

**5**

### Universities

Integrated into the portal(3), in the process of integration(2).

# Partner Specific Use Case 2: Impact Investments DAO

## Problem: Public funding is limited and private investment is weak.

High dependence on government funding:

**6 081.5 billion**

The current expenses of educational organizations in 2024 amounted to 6081.5 billion tenge (National Bureau of Statistics)

Private sector role in basic education is very small compared to international benchmarks.

**1,6%**

of primary school pupils are in private schools in Kazakhstan (UNESCO UIS).

## Public funding and regulation is ineffective

**62.4 billion tenge**

In 2024, an audit revealed ineffective use of 62.4 billion tenge in education

## ImpactDAO channels international and domestic investment into education and innovation through blockchain-native governance:

### ICO →

Token Sales for Private Investors in Crypto-Friendly Jurisdictions

**Markeing Focus:**
- USA
- MENA: Abu Dhabi, Qatar and Saud Arabia.
- Hong Kong
- Singapore

**Listing Platforms:**
- CoinList
- Binance

### Impact DAO →

Tokenized Impact Fund For Development of Human Capital

Transparent in real time
**On-Chain Operations: DAO and Real Time Explorer**

Smart Data-Driven Decisions
**Impact Investment Intelligence Toolkit**

Engaging:
**Events and Rewarding Mechanism for Stakeholders**

### Impact Investment

Impact Investment Flow to Kazakhstan

**Portfolio:**
- Infrastructure development
- Innovative Programs
- Edtech projects

**Instruments:**
- Private Equity
- Venture Investment
- Impact Bonds
- Credits

# Partner Specific Use Case 3: SilkwayChain Project: Kazakhstan–China Joint Research

**Problem:** Cross-border trade between China, Central Asia, and Europe faces slow customs, fraud in trade documents, lack of transparency, and costly trade finance.


**Solution:** SilkwayChain, a joint research project initative to create a trusted digital trade corridor between Kazakhstan and China.

- **Fraud-Proof Trade Docs** — Digital certificates and invoices secured on-chain.
- **Smart Customs** — Automated clearance at Khorgos, Aktau, and Almaty hubs.
- **On-Chain Trade Finance** — Blockchain letters of credit and tokenized invoices.
- **Interoperability** — Seamless data exchange between Kazakh and Chinese systems.

**Impact**

- Cuts processing time from weeks to days.
- Reduces fraud risk by over 90%.
- Unlocks trade finance for SMEs, closing part of Asia's $2.5T trade finance gap.
- Positions Kazakhstan as the regional leader in digital trade facilitation.

**Strategic Alignment:**
Supports Digital Kazakhstan and the 2050 Strategy for global value chain integration.

Advances China's Digital Silk Road and Belt and Road Initiative.

Lays foundation for a Kazakhstan–China Joint Venture with shared nodes and governance.

# Governance & Regulation

KazSmartChain (KSC) is must be governed through a clear, Kazakhstan-sovereign framework that combines legal oversight, academic innovation, and multi-stakeholder input. This ensures the network is secure, compliant, and trusted – both nationally and internationally.

**Planned Core Entities**

- **KazSmart Foundation (KSF)** — Independent body based at the Astana International Financial Centre (AIFC). Oversees compliance, strategic direction, validator eligibility, and international partnerships. Ensures KSC operates under Kazakh law and is shielded from foreign interference.
- **Blockchain and Fintech Lab** — Technical steward and R&D hub. Designs and tests protocol upgrades, runs a founding supernode, sets technical standards, and builds local talent capacity.

**Advisory & Oversight**

**Multistakeholder Advisory Board** — Includes government, industry, academia, and civil society representatives. Provides guidance, reviews upgrades, and ensures development reflects national priorities and public interest.

**National Oversight** — Advisory Board reports into Kazakhstan's digital governance bodies, integrating KSC into the broader Digital Kazakhstan strategy while maintaining operational independence.

**Legal & Global Alignment Vision**
Anchored in Kazakhstan's upcoming Digital Code and AIFC legal framework.
Complies with FATF standards (AML/CFT) and OECD principles (transparency & accountability).

Benchmarked against EU blockchain strategy and global best practices to enable interoperability and cross-border trust.

**Public–Private–Academic Cooperation**
Government provides regulatory clarity.
Private sector builds services and runs validator nodes.
Academia drives innovation and skills.
Civil society ensures accountability and incl

**Summary**
KSC governance must balances sovereign control with open participation. A Foundation for compliance, a University Lab for innovation, and an Advisory Board for inclusivity together will create a trusted, future-proof national blockchain aligned with Kazakhstan's strategic vision and international standards.

# Tokenomics and Staking Strategy

**KazSmartChain (KSC)** is designed to be secure, sovereign, and inclusive, with tokenomics that align with Kazakhstan's legal framework and global best practices.

**Staking Model Vision**
**Validators:** Only approved Kazakhstani entities (banks, telcos, universities, agencies) run validator nodes — ensuring sovereignty, compliance, and trust.

**Delegation**: Anyone, in Kazakhstan or globally, can delegate their KSC tokens to validators. This combines national control with broad participation.

**Why Hybrid?** Protects critical infrastructure while opening the door to community involvement and decentralized security.

**Validator Network Plan**
Launch with ~21 validators (odd number for efficient consensus).

Mix of financial, telecom, academic, and government-related institutions.

Expand gradually to 30–40 over time.

Validators must meet strict criteria: licensing, infrastructure, and minimum stake.

**Token Design**
KSC Utility Token: Native token used for gas, staking, and validator rewards. Designed as a pure utility (not a currency). Moderate inflation + transaction fee burns stabilize value.

**KZT Stablecoin Integration Plan:**
Digital Tenge (CBDC) or licensed KZT stablecoin for everyday payments and government services. Stable value for citizens, businesses, and dApps.

**Dual Model:** Utility token secures the network; stablecoin powers commerce

**Distribution & Launch Strategy**
*Phase 1:* Strategic allocation to validator institutions (skin in the game).
*Phase 2*: Treasury reserve for ecosystem growth and grants.
*Phase 3:* Gradual release via licensed exchanges (AIFC).
*Phase 4*: Community rewards and targeted airdrops (developers, early adopters, citizens).
**No ICO:** Avoid speculative "cash grabs" — KSC is infrastructure, not a fundraising gimmick.

**Regulatory Alignment Plan**
*KSC Utility Token*: Registered as a digital asset under Kazakhstan's Digital Asset Law.
*Stablecoin:* Issued only with NBK approval, fully backed, and regulated.
AML/CFT standards built in (FATF-aligned).

**Summary**
KSC's tokenomics combine sovereign security with global participation. A hybrid staking model, dual-token design, and phased, compliant launch ensure long-term sustainability. Citizens gain stability through the digital tenge; validators and stakers secure the network through KSC. Together, this creates a trusted foundation for Kazakhstan's digital economy.

# Sustainability Strategy

KazSmartChain (KSC) is designed to be a green, future-proof blockchain, aligned with Kazakhstan's carbon-neutral vision (net zero by 2060) and global climate goals (UN SDGs, Paris Agreement).

**Verified Environmental Impact and Transparent auditing through:**

- Annual sustainability reports in line with ESG standards.
- On-chain verification (oracles & satellite imagery to confirm tree planting and carbon storage).
- Partnerships with NGOs, UNDP, or local agencies to certify impact.
- Result: Every KSC transaction contributes directly to real, verifiable climate action.

**Renewable Energy for Validators**
Validators can be hosted in Kazakhstan's renewable hubs (wind in Zhambyl, solar in Turkestan, hydro in Almaty/Zhetysu).

**Goal:** majority of KSC computing powered by clean energy, with backup from storage/balanced hybrid grids.

Model: Co-location with solar/wind farms to directly tie blockchain growth to green energy expansion.

**Green Treasury Fund**
A small % of gas fees or block rewards is directed into a Green Treasury.

**Uses:**

- Support Kazakhstan's reforestation program (2 billion trees by 2027).
- Purchase certified carbon credits.
- Fund local climate projects with transparent, on-chain reporting.
- Inspiration: global ReFi projects like Kyoto blockchain, but tailored to Kazakhstan's national goals.

# Roadmap

KazSmartChain (KSC) will grow in carefully managed phases, combining regulatory legitimacy, technological robustness, and ecosystem openness. The three-year roadmap builds from controlled pilots to full national infrastructure and international integration.

**Phase 0 – Demonstration & Legitimacy (Q4 2025)**

- Genesis Testnet launched by NU Blockchain & FinTech Lab.
- Early demonstrators: digital credentials, DAO prototype, token transfers.
- Founding validator group (NU, Ministry of Digital Development & AI, National Bank, key banks/telcos).
- First Transparency Report in line with the Digital Code.

**Phase 1 – Controlled Genesis Mainnet (Q1–Q2 2026)**

- Launch of Genesis Mainnet with 5–9 institutional validators.
- Delegated staking for citizens/enterprises.
- Pilots: education (verifiable credentials), finance (Impact DAO).
- Independent security audit completed.
- Green Treasury activated (fee share → sustainability projects).

**Phase 3 – National Mainnet Recognition (2027)**

- KSC formally recognized in the Digital Code as sovereign infrastructure.
- Validators expanded to 18–21 national institutions.
- Dual-asset model: KSC token for gas + Digital Tenge/KZT stablecoin for settlement.
- Transition of pilots (education, finance, trade) into production systems.
- Annual ESG & Sustainability Report introduced.

**Phase 4 – Ecosystem Expansion & International Integration (2028)**

- Validators expanded to 24–30 institutions across sectors.
- Developer Fund & accelerator launched (target: 50+ dApps).
- Cross-chain interoperability with Ethereum L2, Solana, JSC, BSN.
- Central Asia Blockchain Summit hosted in Astana.
- Protocol-level ESG: on-chain carbon credits & sustainability oracles.

**Strategic Rationale**

KSC's roadmap emphasizes measured growth with national oversight: start small and sovereign (testnet + limited validators), then expand toward national recognition and global connectivity. This path ensures Kazakhstan develops a trusted, compliant, and sustainable blockchain backbone, securing its role as a digital hub for Central Asia.

# Conclusion

KazSmartChain (KSC) is Kazakhstan's potential strategic vehicle for achieving digital sovereignty and modernizing national data infrastructure. It directly supports President Tokayev's 2025 call for Kazakhstan to become a "fully digital nation within three years" by anchoring the Digital Code's agenda on AI, big data, and the platform economy in a secure, sovereign blockchain layer.

Domestically, KSC provides the backbone for critical national datasets (e.g., land registries, resource allocation, public services), while integrating with existing platforms such as the eGov portal (already used by 90% of citizens) and future initiatives like the QazTech AI ecosystem.

Its governance design blends regulatory oversight with decentralization, ensuring alignment with Kazakhstan's laws and international standards. Beyond efficiency and security, KSC advances ESG and climate goals by enabling transparent sustainability reporting and green finance mechanisms consistent with Kazakhstan's Carbon Neutrality Strategy 2060.

Externally, KSC positions Kazakhstan as a regional digital hub at the crossroads of Central Asia and Eurasia's "Digital Silk Road."

By offering trusted cross-border data infrastructure, it complements Belt & Road initiatives and emerging smart logistics platforms (e.g., Smart Cargo). This creates a foundation for attracting regional investment and embedding Kazakhstan into global digital value chains.

In sum, KazSmartChain is conceived not as an experimental blockchain, but as a policy-aligned, future-proof infrastructure:

- Sovereign in governance and legal jurisdiction.
- Flexible and scalable to support AI, fintech, and public-sector applications.
- Sustainable by design, contributing to Kazakhstan's climate and ESG commitments.
- Internationally interoperable, reinforcing Kazakhstan's role as a digital bridge between East and West

.

- By combining technical robustness, regulatory legitimacy, and strategic foresight, KSC will secure Kazakhstan's internal digital development and projects leadership across the Central Asian digital ecosystem.

# Contacts

Blockchain & Fintech Lab

Powered by NU IMPACT FOUNDATION

ASTANA BUSINESS CAMPUS

Author:

Syrym Serikov Serzhanuly

Phone

+ 7 777 646 32 46

Email

serikov.syrym1@gmail.com

Address

Nazarbayev University, Block 1, Floor 2