WHITE PAPER

Tokenization of Real-World Assets (RWA): A Commodity-Backed Model for Mineral Reserves and Infrastructure

1. Executive Summary

The tokenization of real-world assets (RWA) is reshaping global capital markets by enabling digital representations of physical assets on blockchain infrastructure. In the mining sector, tokenization unlocks a new financing paradigm: **digital commodity tokens backed by verified in-ground mineral reserves**.

This model creates a dual-track capital structure:

- **Equity** for ownership, governance, and long-term value creation
- **Commodity tokens** representing contractual claims on physical metals (Au, Ag, Cu, Co), redeemable for delivery or spot-price equivalent

"Digital tokens backed by physical mineral reserves… Tokens represent contractual claims on physical Au, Ag, Cu and Co — redeemable for delivery or spot-price equivalent."

This white paper outlines the architecture, legal framework, market opportunity, and benefits of this model.

2. The Problem: Capital Inefficiency in Mining and Infrastructure

Mining and Infrastructure companies face a structural financing challenge:

- **High upfront capital requirements**
- **Long development timelines**
- **Equity dilution** as the default funding mechanism
- **Debt constraints** tied to commodity cycles
- **Limited liquidity** until production begins

Traditional financing forces early-stage projects to sell ownership at deep discounts or take on restrictive debt.

Yet the underlying reserves — the very basis of future value — remain **illiquid** until extraction.

Tokenization solves this.

3. The Solution: Commodity-Backed Tokenization

The proposed model introduces a **two-track capital structure**:

3.1 Equity Track (Traditional Capital Markets)

- Listed equity on CSE / TSX-V
- Voting rights
- Profit participation
- Ownership of the operating entity

3.2 Token Track (Commodity-Backed Digital Assets)

- Tokens represent **contractual claims** on physical metals
- Redeemable for **physical delivery** or **spot-price equivalent**
- No voting rights, no dividends, no equity
- Governed by **Commodity Purchase Agreements (CPAs)**
- Smart-contract architecture ensures transparency and auditability

“Commodity tokens fund operations. No voting, no dividends, no equity… governed by separate Commodity Purchase Agreements — never bundled with shares.”

3.3 Strict Separation of Tracks

The equity and token tracks are legally and operationally independent:

- Tokens are **not** investment contracts
- Tokens are **not** tied to company performance
- Tokens are **not** securities

This separation is essential for regulatory clarity.

4. Token architecture

“Digital tokens backed by physical mineral reserves… Tokens represent contractual claims on physical Au, Ag, Cu and Co — redeemable for delivery or spot-price equivalent.”

4.4 On-chain proof-of-reserves framework

To maintain trust in a pre-extraction environment, the proof-of-reserves (PoR) framework combines off-chain expert validation with on-chain attestations:

- **Independent geological validation: NI 43-101 or JORC-compliant reports** prepared by Qualified Persons (QPs) form the technical basis for reserve backing.
- **Third-party audits:** Periodic audits confirm that reserve statements, mine plans, and production schedules remain consistent with token supply.
- **On-chain attestations:** Hashes of key reports, audit letters, and reserve updates are anchored on-chain, creating an immutable evidence trail.
- **Dynamic reserve ratio monitoring:** Dashboards track the ratio of outstanding tokens to verified reserves, with automated alerts if thresholds are approached.

4.5 Custody, logistics, and redemption stack

Because tokens are redeemable for physical metal or spot-price equivalent, the operating stack must be defined up front:

- **Vaulting and logistics partners:** Pre-contracted refineries, smelters, and vaults handle conversion from ore to refined metal and final storage.
- **Redemption SLAs:** Commodity Purchase Agreements (CPAs) specify timelines, minimum redemption sizes, fees, and delivery locations.
- **FX and pricing oracles:** Spot-price equivalent redemptions rely on robust price oracles (multi-source, time-weighted) and FX feeds for cross-currency settlement.
- **KYC/AML at redemption:** Redemption flows integrate KYC/AML and sanctions screening, aligned with local VASP/AML regimes where applicable.

“Commodity tokens fund operations. No voting, no dividends, no equity… governed by separate Commodity Purchase Agreements — never bundled with shares.”

5. 5. Legal classification: commodity, not security (expanded)

“Tokens classified as commodities — not securities.”

5.5 U.S. regulatory perimeter: CFTC vs. SEC

The structure is engineered so that tokens fall under **commodity** treatment rather than **securities** law in the U.S.:

- **CFTC lens (commodity):** Where tokens represent fully-backed, deliverable claims on metals (Au, Ag, Cu, Co) with no profit-sharing, governance, or managerial-effort dependence, they align with commodity-style products. The CFTC has already acknowledged tokenized real-world assets and tokenized collateral as compatible with existing commodity frameworks when underlying assets are eligible and legal rights are clear.
- **SEC lens (securities):** The design explicitly avoids the **Howey Test** triggers—no expectation of profit from the efforts of others, no pooled enterprise, no equity-like upside. Most RWA tokens that embed yield or profit-sharing are treated as securities; this model deliberately strips those features to preserve commodity status.
- **Practical stance:** Even with a commodity thesis, U.S. distribution may still rely on exemptions (e.g., Reg S for non-U.S. investors, or Reg D for tightly controlled U.S. flows) to mitigate residual securities risk and secondary-market complexity.

5.6 Canada: CSA and non-security commodity treatment

Under Canadian Securities Administrators (CSA) guidance, a token that is:

- Fully backed by a physical commodity,
- Redeemable for that commodity or its cash equivalent, and
- Devoid of profit-sharing, governance, or pooled-investment features

can be positioned as a **non-security commodity product**, particularly when structured via CPAs and delivered through registered dealers or exempt market channels where needed. The equity of the

operating company remains squarely within securities regulation; the tokens sit in a separate commodity and derivatives perimeter.

5.7 European Union: MiCA and Asset-Referenced Tokens (ARTs)

Under the EU's Markets in Crypto-Assets Regulation (MiCA), commodity-backed tokens will typically fall into the **Asset-Referenced Token (ART)** category when they reference one or more non-EU currencies or commodities.

Key implications:

- **Issuer authorization:** ART issuers must be authorized and comply with capital, governance, and white-paper disclosure requirements.
- **Reserve and custody rules:** MiCA mandates robust reserve management, segregation, and auditability—aligned with the proof-of-reserves model described in Section 4.4.
- **Marketing and distribution:** Cross-border EU distribution requires MiCA-compliant disclosures and, in some cases, host-state notifications.

5.8 Singapore: MAS and non-DPT commodity structures

The Monetary Authority of Singapore (MAS) primarily regulates **Digital Payment Tokens (DPTs)** and capital-markets products. A physically-backed commodity token with no payment function, no yield, and no equity-like features can be positioned as a **non-DPT commodity product**, but:

- If offered as an investment scheme, it may still fall under the **Securities and Futures Act (SFA)**.
- If used as a means of payment or widely traded as such, DPT rules may apply.

Accordingly, the model emphasizes **commodity purchase and redemption**, not payments or yield-bearing investment schemes.

5.9 Hong Kong: SFC and virtual asset perimeter

For Hong Kong, where proximity to Mongolia and China is strategically relevant, the Securities and Futures Commission (SFC) treats most **virtual assets** with investment characteristics as regulated products. A commodity-backed token:

- May be treated as a **virtual asset** but not necessarily a "security" if it is strictly a deliverable commodity claim;
- Could still trigger licensing requirements for **virtual asset trading platforms (VATPs)** and intermediaries dealing in or advising on such tokens.

Structuring distribution through licensed VATPs and ensuring clear commodity-only rights (no profit-sharing, no governance) supports a non-security positioning while remaining inside the SFC's virtual asset framework.

5.10 Other key regulators and cross-border themes

- **AML/CTF:** FATF-aligned Travel Rule, KYC/AML, and sanctions screening apply across major jurisdictions.
- **Custody and insolvency:** Many regimes focus on segregation of client assets, bankruptcy remoteness, and clear title—issues addressed via SPVs, trusts, and CPAs.
- **Derivatives overlays:** If leveraged, synthetic, or futures-style exposure is added, derivatives regulation (CFTC, ESMA, MAS, etc.) may apply, even if the base token is commodity-style.

6. Benefits of Tokenization

6.1 Pre-Extraction Liquidity

Unlock value from mineral reserves before production.

6.2 Global Commodity Access

Lower participation thresholds democratize access to metals.

6.3 Transparent Ownership

On-chain records eliminate opaque registries.

6.4 Physical Redemption

Tokens can be redeemed for physical delivery or spot value.

6.5 No Equity Dilution

Token issuance reduces reliance on equity financing.

6.6 Digital Treasury

A verifiable digital reserve strengthens the balance sheet.

7. Market Opportunity

7.1 US$2T+ Global Mining Market

Copper, gold, silver, and cobalt remain core industrial and monetary commodities.

7.2 US$10T Tokenized Asset Market by 2030

Tokenization is one of the fastest-growing segments in global finance.

Gold-backed tokens alone are growing **~50% YoY**.

7.3 US$1B+ Commodity-Token Market Cap

PAXG, Tether Gold, and others prove product-market fit.

8. Target Investors

- Institutional investors seeking RWA exposure
- Crypto-native investors
- Commodity traders
- Retail commodity buyers

This hybrid investor base is unique to tokenized commodities.

9. Risk Considerations

9.1 Geological Risk

Mitigated through NI 43-101 / JORC compliance.

9.2 Regulatory Risk

Addressed through strict separation of equity and tokens.

9.3 Operational Risk

Token redemption requires robust logistics and supply chain partners.

9.4 Market Volatility

Commodity prices fluctuate; tokens track spot value.

10. Implementation roadmap (expanded to "full tokenization")

"Tokenization represents a structural evolution in how mining projects are financed, owned, and accessed. By creating a commodity-backed digital asset, mining companies unlock liquidity, transparency, and global participation — without equity dilution."

Phase 1 — Reserve verification and technical foundation

- **Step 1.1: Geological data consolidation** Compile all historical drilling, sampling, and geophysical data into a unified geological model.
- **Step 1.2: NI 43-101 / JORC report preparation** Engage Qualified Persons to produce compliant technical reports defining resources and reserves.
- **Step 1.3: Independent technical audit** Commission third-party audits to validate methodologies, assumptions, and reserve classifications.
- **Step 1.4: On-chain anchoring of reports** Hash and timestamp key reports and audit letters on-chain as the initial proof-of-reserves baseline.

Phase 2 — Legal structuring and regulatory mapping

- **Step 2.1: Corporate and SPV design** Define the operating company, holding entities, and any SPVs or trusts that will issue tokens and hold reserves.
- **Step 2.2: Commodity Purchase Agreements (CPAs)** Draft CPAs that govern token issuance, redemption, pricing, and logistics—explicitly separating them from equity documentation.
- **Step 2.3: Jurisdictional analysis and opinions** Obtain legal opinions in key markets (U.S., Canada, EU, Singapore, Hong Kong) confirming commodity classification where feasible and mapping any securities/derivatives touchpoints.
- **Step 2.4: Licensing and registrations** Identify and secure any required licenses (e.g., money services, virtual asset service provider, MiCA ART issuer, commodity dealer) or partner with already-licensed entities.

Phase 3 — Token architecture and smart-contract deployment

- **Step 3.1: Token specification and standard selection** Define token standard (e.g., ERC-20 with compliance extensions such as ERC-1400/3643), metadata, and redemption logic.
- **Step 3.2: Smart-contract development and audit** Build issuance, burning, and redemption contracts; integrate PoR oracles; commission independent security audits.
- **Step 3.3: Compliance and KYC modules** Embed whitelisting, transfer-restriction, and KYC/AML hooks to align with jurisdictional requirements and exchange listing rules.
- **Step 3.4: On-chain reserve attestation integration** Connect off-chain audit feeds and geological updates to on-chain PoR contracts for periodic or real-time attestations.

Phase 4 — Market launch and primary distribution

- **Step 4.1: Equity track activation** Complete CSE/TSXV listing (or equivalent), finalize equity disclosures, and communicate the dual-track structure to investors.
- **Step 4.2: Token issuance and initial sale** Mint an initial tranche of tokens aligned with verified reserves and sell under CPAs to institutional, crypto-native, and commodity buyers.
- **Step 4.3: Exchange and OTC integrations** List tokens on compliant centralized exchanges (CEXs), permissioned DEX pools, and OTC desks that support commodity-backed assets.
- **Step 4.4: Treasury and balance-sheet integration** Hold a portion of tokens in a **digital treasury** as a verifiable on-chain asset, strengthening the corporate balance sheet.

Phase 5 — Secondary markets, scaling, and multi-asset expansion

- **Step 5.1: Secondary-market liquidity programs** Establish market-making, liquidity pools, and cross-venue connectivity to support 24/7 trading and tight spreads.
- **Step 5.2: Ongoing compliance and reporting** Maintain regular geological updates, PoR attestations, and regulatory filings; adapt to evolving CFTC, SEC, MiCA, MAS, and SFC guidance.
- **Step 5.3: Additional metals and baskets** Extend the model to additional metals and structured baskets (e.g., Cu/Au/Ag baskets, green-metal indices) with separate CPAs and reserve pools.
- **Step 5.4: Institutional integrations** Integrate with custodians, prime brokers, and RWA platforms so tokens can be used as collateral, treasury assets, or structured-product underlyings.

11. Conclusion

Tokenization represents a structural evolution in how mining projects are financed, owned, and accessed. By creating a **commodity-backed digital asset**, mining companies unlock liquidity, transparency, and global participation — without equity dilution.

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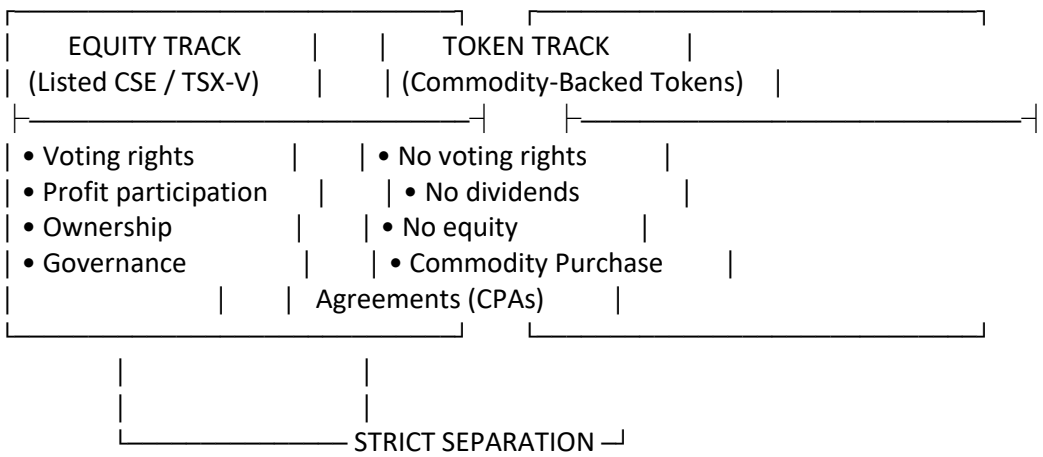
1. Dual-Track Capital Structure Diagram



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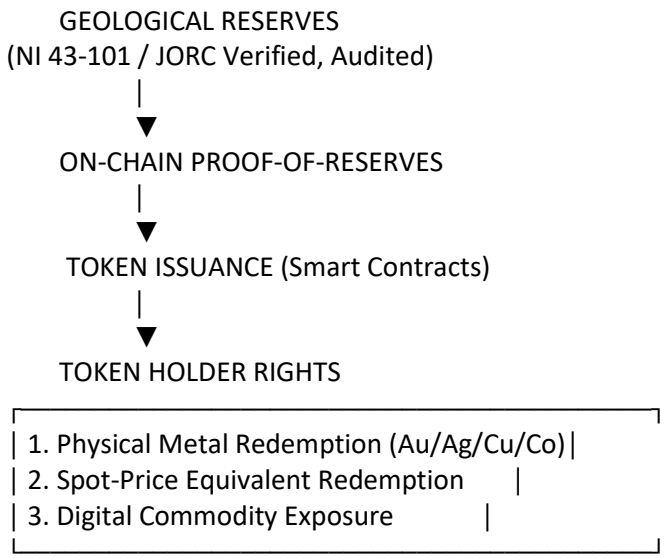
2. Token Backing & Redemption Flow



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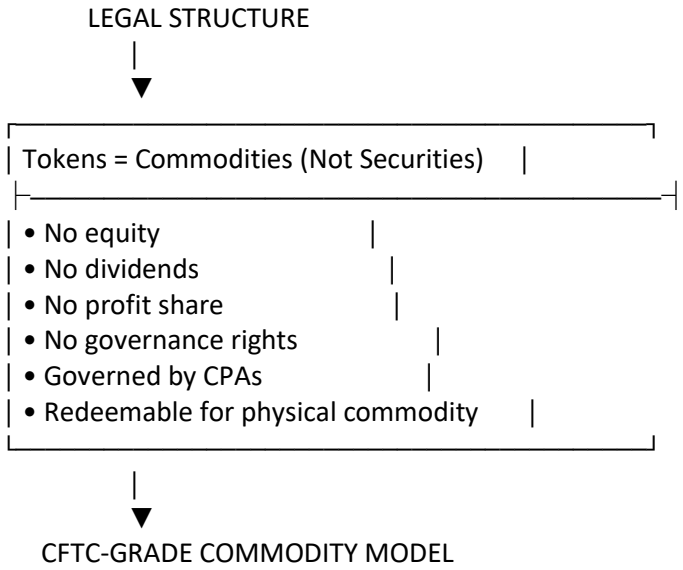
3. Legal Classification Framework



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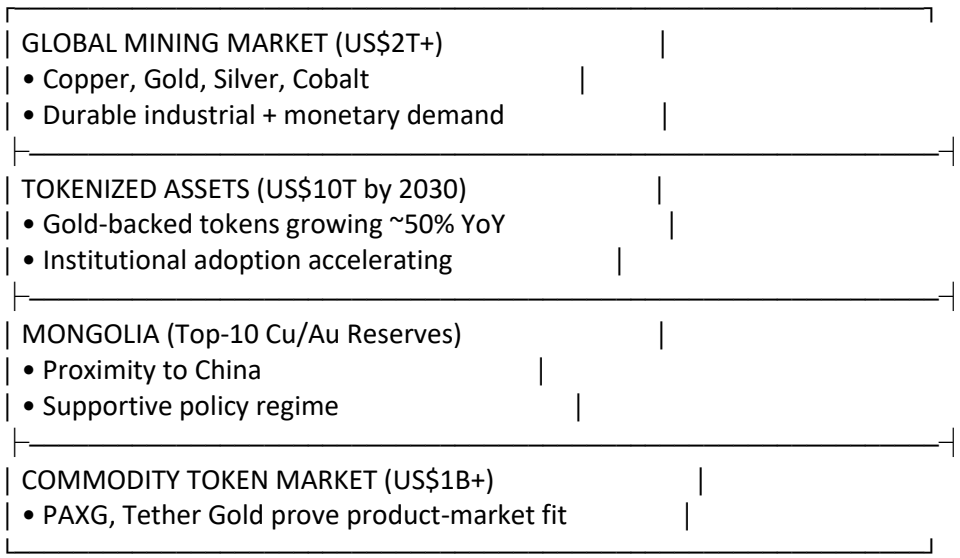
4. Market Opportunity Landscape



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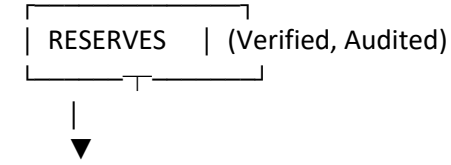
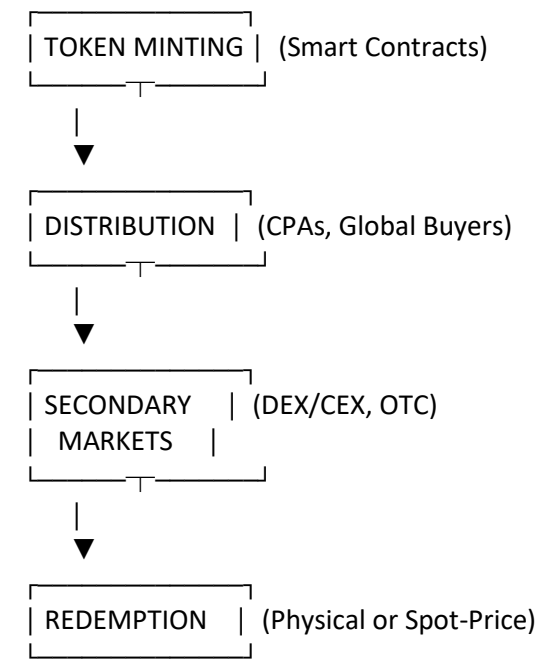
5. Token Lifecycle Diagram





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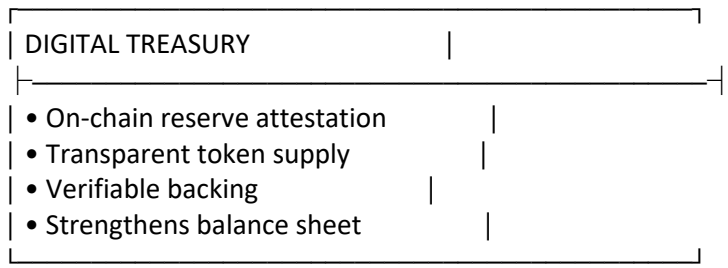
6. Digital Treasury Model



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7. Regulatory Positioning Map

USA (CFTC) → Commodity
Canada (CSA) → Non-security commodity
EU (MiCA) → Asset-Referenced Token (ART)
Singapore (MAS) → Non-DPT commodity
