Tokenisation of Green Bonds in Thailand

Market Infrastructure, Regulation and Implementation Roadmap

Executive Summary · Jason Lee Je Sen · November 2026

The proposition

The next advance in Thailand's bond market will not be achieved simply by placing existing securities on a blockchain. A digital representation of a bond has limited value if the legal claim, ownership register, payment system, investor protections and post-issuance reporting remain fragmented. The more consequential opportunity is to redesign how those functions work together. For green bonds, this also raises a further question: can the environmental claim attached to a security become as traceable and verifiable as its financial obligations?

This research argues that tokenisation can improve the efficiency, accessibility and credibility of Thailand's green debt market, but only when treated as a regulated market-infrastructure and governance reform rather than a standalone financial product. Its central contribution is a proposed five-layer Tokenised Thai Green Bond Reference Architecture (TTGB-RA), designed around existing Thai institutions and international standards and intended for subsequent pilot testing. Within that architecture, the proposed Green Data Covenant links proceeds allocation, taxonomy alignment and independent review to the bond's digital record throughout its life.

Why Thailand, and why now

Thailand has an established fixed-income market and a growing labelled-bond segment, but market depth should not be confused with broad participation. At the end of 2024, ESG-labelled bonds outstanding totalled approximately THB 818 billion, or 4.8% of the THB 17.1 trillion domestic bond market, following 24% annual growth. This is the aggregate for green, social, sustainability and sustainability-linked instruments; green bonds specifically accounted for approximately THB 138.4 billion. Government-sector instruments represented approximately 70% of ESG bonds outstanding at that date, while corporate issuers faced the continuing costs of arranging, verifying and reporting labelled securities—barriers to widening participation (ThaiBMA, Annual Report 2024).

Thailand nevertheless possesses much of the institutional groundwork needed for a more integrated system. The Bank of Thailand's DLT Scripless Bond project demonstrated a reduction in the government savings-bond issuance process from fifteen days to two. The ThaiBMA DIF Web Portal has digitised elements of corporate issuance. PTTEP's THB 6 billion corporate bond distributed through the Pao Tang application in 2021 demonstrated the reach of digital retail channels; the 2024 PTT Q-Bond tested blockchain-based corporate issuance and tokenised payment. The government's G-Token initiative and the Bank of Thailand's programmable-payment sandbox add further experience in digital instruments and settlement. These initiatives establish technical and institutional capability, although none, individually, amounts to the integrated tokenised green bond architecture proposed here.

The Thailand Taxonomy, developed in two phases covering energy, transport, manufacturing, agriculture, construction and real estate, and waste management, supplies the domestic environmental classification framework. The ICMA Green Bond Principles frame four core elements —use of proceeds, project evaluation and selection, management of proceeds, and reporting—while the separate ICMA Bond Data Taxonomy standardises machine-readable bond information. These frameworks make it possible to connect financial-market modernisation with more disciplined environmental accountability.

Evidence and research approach

The analysis uses Design Science Research, following Hevner and colleagues and Peffers and colleagues. Rather than conducting an ex post evaluation of a Thai issuance that has already occurred, it develops a reference design, maps that design against existing institutions, and establishes criteria for testing it in future pilots. The paper's demonstration is an analytical mapping against Thai infrastructure rather than a working pilot; its evaluation is ex ante. Its proposed system and quantified targets are not observed Thai-market results.

International experience establishes that the underlying technologies are credible, but also that their economic effects are conditional. A 2023 study by researchers at the Hong Kong Monetary Authority found underwriting fees around 0.22 percentage points lower for tokenised bonds, equivalent to a 25.8% reduction relative to matched conventional bonds, and yield spreads around 0.78 percentage points lower, equivalent to 23.9%. It also reported 5.3% narrower bid–ask spreads, with larger liquidity improvements in transactions accessible to retail investors (Leung et al., 2023). These findings are useful benchmarks, not a forecast for Thailand: the underlying sample was small and the yield-spread result was statistically significant only at the 10% level. Hong Kong's sovereign digital green bond programme progressed from HKD 800 million in 2023 to approximately HKD 6 billion in 2024 and HKD 10 billion in 2025. The 2024 issue adopted the ICMA Bond Data Taxonomy, while the 2025 issue incorporated tokenised central-bank money in settlement. These transactions, alongside BIS research and European pilots, demonstrate technical feasibility, while legal certainty, interoperability, custody and liquidity remain constraints.

This leads to a deliberately qualified conclusion. Tokenisation may reduce administrative duplication, reconciliation and settlement exposures; it does not, by itself, eliminate the costs of regulation, market-making, custody, cybersecurity or environmental verification. The appropriate test is whether a redesigned end-to-end process produces measurable net benefits after those costs are included.

The five-layer reference architecture

The TTGB-RA links five functions that are often treated separately. First, legal form must establish that a DLT-recorded instrument is an enforceable debt security with rights equivalent to those attached to a conventional bond. Second, issuance workflow should translate deal terms, allocation and green-bond framework information into standardised, machine-readable records compatible with existing offering channels. Third, registry and custody arrangements must establish the

authoritative record of holdings, distinguish legal title from beneficial interests where necessary, and maintain standards for segregation, recovery, operational resilience and investor protection. Fourth, delivery-versus-payment (DvP) settlement must connect transfer of the security with final payment under a legally robust mechanism. Fifth, the Green Data Covenant must make the environmental obligations attached to the instrument traceable across its life.

The design deliberately preserves the roles of market institutions rather than assuming that they can be removed. Issuers, arrangers, registrars, depositories, settlement banks, the securities regulator, the central bank and independent environmental reviewers would remain accountable for their respective functions. Their records and control points could, however, become more interoperable, reducing the need for repeated manual reconciliation.

The Green Data Covenant: making environmental integrity auditable

The Green Data Covenant is the paper's distinctive proposal. Conventional green bonds generally communicate environmental eligibility and impact through an issuance framework, external opinions and periodic reports. These practices are important, but the resulting evidence can be dispersed across documents and systems, making it difficult for investors to establish what was financed, whether the allocation remains eligible, and when it was last independently assessed. The Covenant proposes an assurance-oriented data layer attached to the tokenised security, without treating the digital ledger itself as proof of environmental performance.

Its first function is to capture proceeds allocation in structured form: disbursement amount, project identifier, relevant Thailand Taxonomy activity, timestamp and a cryptographic link to the underlying evidence. The second is to test taxonomy alignment at defined intervals—proposed as quarterly, or following a material change—and record the outcome. The proposed green-bond framework is confined to activities classified green under the Thailand Taxonomy; amber transition activities fall outside its intended label. Potential misalignment would generate a flag for explanation, remediation and external review rather than automatically causing an event of default. The third is to incorporate digitally signed assessments from independent reviewers, allowing investors and supervisors to determine who provided an opinion, its scope and the date to which it relates.

The governing principle is that programmability should strengthen professional judgement, not replace it. Environmental performance data originate outside the ledger: a renewable-energy project's generation data, a factory's emissions record or a building's efficiency measurement must be collected, validated and transmitted by trustworthy parties. This 'oracle problem' remains a material implementation challenge. Accordingly, the design assigns identifiable data responsibilities to issuers, external reviewers and the authorities responsible for taxonomy updates, and requires controlled data feeds, provenance and mechanisms for resolving disputed classifications. Investors would gain more timely access to the latest substantiated information, not a guarantee of continuously verified real-world environmental outcomes.

Settlement design and sequencing

A practical transition should follow the maturity of Thailand's payment infrastructure. The paper proposes beginning in 2026–2027 with a DLT-based bond record linked to BAHTNET for conventional central-bank-money settlement. This is the least disruptive route, although separate securities and cash systems limit the benefits of atomic settlement. For 2027–2028, subject to regulatory approval and proven safeguards, tokenised private money—such as regulated deposit or electronic-money arrangements tested in the Bank of Thailand's sandbox—could support on-chain DvP. Simultaneous exchange can reduce principal settlement risk, but the creditworthiness of the payment instrument, its liquidity, interoperability and legal finality remain essential. From 2028 onwards, wholesale central bank digital currency is envisaged as a possible further stage, conditional on the Bank of Thailand's policy decisions. These dates are proposed sequencing milestones, not commitments by regulators or evidence that each stage has been implemented.

Six regulatory priorities

The technology roadmap depends on six complementary regulatory actions. Thailand needs a permanent legal basis for DLT-registered debt securities within, or clearly bridged to, the Securities and Exchange Act; a coherent digital-bond issuance framework and standardised machine-readable disclosure; formal recognition and supervision of DLT-based registries and custodians; a durable regime for programmable-baht settlement instruments; specific integrity requirements for tokenised green bonds, including the Green Data Covenant and external review; and cross-border interoperability arrangements that address both settlement and the recognition of environmental classifications. The proposed workstreams run from 2026 into 2028 and beyond, with responsibilities distributed among the SEC, Ministry of Finance, ThaiBMA, TSD, Bank of Thailand and regional counterparts. They are proposals, not enacted measures or binding agency timetables.

Regulatory coordination is therefore central to the commercial case. If each pilot relies on different exemptions, data standards and payment arrangements, tokenisation risks producing additional platforms without achieving a more efficient market. A coherent framework would allow market participants to invest against predictable legal and operational requirements. The SEC and SET strategic plans for 2026–2028 provide relevant policy context, but do not themselves settle the legal questions identified in the paper. Regional compatibility with the ASEAN Taxonomy is desirable, but cross-border recognition and legal equivalence would still require jurisdiction-specific agreement and validation.

Economic value, tests and limitations

The paper specifies six performance dimensions for future Thai pilots: underwriting costs, yield spreads, settlement time, minimum investment size, frequency of taxonomy verification and accessibility of independent attestations. Its indicative targets include a 25% reduction in underwriting fees, a 15–24% reduction in yield spreads, T+1 settlement in an initial phase and a longer-term move towards T+0, retail denominations of THB 1,000, and quarterly machine-assisted taxonomy checks. These are design targets, not expected outcomes: in particular, the yield-spread

target rests on limited international evidence. They require comparison against like-for-like Thai instruments and full accounting of technology and compliance expenditure.

One cost illustration in the study applies a hypothetical ten-basis-point financing-cost reduction to the THB 818 billion stock of all ESG-labelled bonds outstanding at end-2024, producing THB 818 million per annum. It is an arithmetic sensitivity, not an estimated saving from green bonds, not a prediction that the entire stock will be tokenised and not a net-benefit calculation. A reliable Thai cost–benefit case will require an appropriately defined eligible issuance base, realistic take-up assumptions, control groups and careful separation of issuance expenses, pricing outcomes and ongoing reporting costs.

Material risks also require explicit testing: cybersecurity, key management and custody failures; technology and platform concentration; fragmentation of secondary-market liquidity; the monetary and credit risks of private settlement tokens; uncertain legal finality; and the reliability and confidentiality of off-chain environmental data. The paper does not claim to have completed an empirical Thai pilot, solved the oracle problem or modelled system-wide financial-stability effects. These are necessary subjects for staged experimentation and future research, together with the feasibility of secondary-market applications such as green repurchase transactions and exchange-traded products.

Conclusion and policy significance

Thailand's opportunity lies in connecting work that is already under way. Digital-bond pilots, payment experimentation, securities-market modernisation, taxonomy development and green-bond reporting have each advanced, but largely through separate institutional channels. The proposed TTGB-RA brings them into one governed sequence, while the Green Data Covenant addresses an issue that is especially consequential for labelled finance: the credibility of a claim cannot rest on the label alone; it must rest on evidence that investors can inspect, interpret and challenge.

A successful first implementation would therefore be judged less by the novelty of the token than by observable improvements in issuance and reporting costs, enforceable settlement and ownership rights, accessible participation, and the reliability of green-bond evidence. If Thailand can demonstrate those results in a carefully governed pilot and then establish common standards, it could help shape how tokenised sustainable debt develops across ASEAN. The central policy choice is whether tokenisation becomes another isolated digital experiment or a disciplined upgrade to the institutions on which market confidence already depends.

Research basis and attribution

Executive summary of Jason Lee Je Sen, "Tokenisation of Green Bonds in Thailand: Market Infrastructure, Regulation and Implementation Roadmap" (2026). Figures are historical, as dated. The analysis and proposals are the author's and do not represent any organisation. Full citations and methodology appear in the underlying research paper.