Web3 for Green:

Enabling Hong Kong's Green Finance with Decentralized Technologies and Structured Disclosure

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HONG KONG 2050 IS NOW

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EXECUTIVE SUMMARY

KEY ARGUMENT

The core argument of this paper is therefore that Web3 should be understood not as a speculative asset story, but as market infrastructure for green finance. In Hong Kong, its main value lies in helping the market move from fragmented, PDF-based disclosure toward machine-readable, auditable, and more trustworthy information systems for green bonds, carbon credits, and other tokenised green real-world assets.

Hong Kong's progress in blockchain-based green finance has followed a clear sequence: proof of concept, live issuance, and then broader experimentation across asset classes. This progression can be seen in three major HKMA initiatives: Project Genesis, Project Evergreen, and Project Ensemble. Project Genesis tested whether tokenised green bonds and environmental data could improve transparency; Project Evergreen moved the model into live sovereign issuance and linked digital bonds with existing market infrastructure; and Project Ensemble now provides a supervised sandbox for cross-border, multi-asset tokenisation. The policy lesson is not the detail of each pilot, but the direction of travel: regulated tokenisation is becoming part of Hong Kong's capital-market infrastructure.

Taken together, these four asset classes show that Hong Kong's opportunity is not limited to tokenising green assets for fundraising. Its greater strategic value lies in building trusted market infrastructure: structures that combine tokenisation, strong disclosure, reliable MRV, structured securitisation pathways and cross-border interoperability. If designed well, such platforms could help channel capital into real decarbonisation projects while reinforcing Hong Kong's role as a regional centre for sustainable finance and green trade.

Technology alone does not determine outcomes. In selected use cases, Web3 infrastructure for green finance is mature enough for institutional deployment. Yet adoption remains slow, fragmented, and concentrated in a small number of pioneer jurisdictions and issuers. The reasons are not purely technical; they reflect a set of connected barriers spanning asset integrity, data quality, regulation, market structure, and institutional capacity.

Hong Kong already has a solid foundation, including tokenised green bond initiatives, digital asset regulation, and the Hong Kong Taxonomy, and newly established policy platforms such as the Tokenised Bond Expert Group. However, important gaps remain in disclosure standardisation, lifecycle governance, and the integration of taxonomies into product-level reporting. To address these gaps, Hong Kong should adopt an infrastructure-focused strategy that links XBRL-like reporting with on-chain record-keeping, develops unified disclosure templates, promotes taxonomy-aligned reporting, and invests in public digital infrastructure. If supported by careful asset selection, clear regulation, and sustained capacity building, these steps could help expand, de-risk, and decarbonise capital flows, while positioning Hong Kong as a leading hub for tokenised green assets by 2030.

INTRODUCTION

This study examines how Web3 technologies can strengthen Hong Kong's green finance ecosystem, especially by improving transparency, standardising disclosure, and building market trust. It focuses on how distributed ledger technology (DLT), tokenisation, and smart contracts can work together with structured digital reporting to support Hong Kong's role as an international green finance centre and its longer-term carbon neutrality goals. To keep the discussion focused and policy-relevant, this paper works within Hong Kong's existing regulatory perimeter for digital assets and securities, particularly for bond issuance: it examines how bonds issued under traditional, fully compliant frameworks can use blockchain and digital technologies to enhance transparency, streamline secondary trading, and improve efficiency. It does not advocate issuing bonds in a decentralised manner, which is left for a possible subsequent phase of research.

1. WHY WEB3 MATTERS FOR GREEN FINANCE

Green finance markets still face persistent problems, including weak disclosure, information gaps between issuers and investors, poor traceability, and high transaction costs in financing distributed real-world projects. These weaknesses make it harder to verify environmental claims and reduce confidence in the market.

Web3 offers a different way to manage and verify information. By recording data on distributed and tamper-resistant ledgers, DLT can turn disclosures from claims that are hard to verify into records that can be audited more easily. Smart contracts can also embed compliance rules into financial instruments, allowing reporting to be triggered automatically, deviations to be flagged in real time, and some monitoring functions to move closer to the underlying activity itself. Four features are especially relevant for green finance:

FIGURE 1 Four features of Web3 that matter for green finance

TRANSPARENCY AND TRACEABILITY. Smart contracts can track the use of proceeds directly within a token, helping ensure that funds are used for pre-defined green activities and triggering alerts when deviations occur.

FRACTIONAL OWNERSHIP AND BROADER MARKET ACCESS. Traditional green bonds often require minimum investments of USD 10,000 or more[1], which can exclude retail investors and smaller institutions. Tokenisation breaks large instruments into smaller units, making them accessible to a wider group of investors, improving liquidity, and bringing more capital into the market.

AUTOMATED LIFECYCLE GOVERNANCE. Smart contracts can make ongoing reporting part of the design of a financial instrument rather than a voluntary promise. For example, coupon payments can be linked to verified environmental KPIs, non-compliance can trigger escrow arrangements, and taxonomy alignment can be set as a condition for disbursement.

STRUCTURED DIGITAL DISCLOSURE. When DLT is combined with structured reporting frameworks such as eXtensible Business Reporting Language (XBRL), each material data point in an impact report can carry a standardised digital tag.

Another important but less discussed use of Web3 is the governance of taxonomy alignment. Green taxonomies, including the Hong Kong Taxonomy for Sustainable Finance, the EU Taxonomy, and the ASEAN Taxonomy, provide formal criteria for identifying environmentally sustainable economic activities.In practice, however, alignment is often declared at issuance, reported only from time to time, and disclosed in formats that are difficult to analyse systematically. DLT can help turn taxonomy alignment from a one-off label into a continuous compliance process. If taxonomy rules are coded into smart contracts and checked automatically against incoming environmental data, taxonomy alignment can become a dynamic and auditable process rather than a static statement in an offering document.

Research suggests that blockchain-based monitoring of green bond obligations can lower monitoring costs, reduce greenwashing risks, and improve market credibility[2]. If taxonomy categories, compliance thresholds, supporting evidence, and alignment status are embedded into smart contract logic, regulators and market participants can gain more timely visibility into the environmental quality of an instrument. This would make inconsistent green labelling harder to sustain and could strengthen trust in the market as a whole.

The core argument of this paper is therefore that Web3 should be understood not as a speculative asset story, but as market infrastructure for green finance. In Hong Kong, its main value lies in helping the market move from fragmented, PDF-based disclosure toward machine-readable, auditable, and more trustworthy information systems for green bonds, carbon credits, and other tokenised green real-world assets.

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2. CURRENT STATUS: WHERE THE MARKET STANDS

2.1 Hong Kong's Supportive Policy Environment

Hong Kong has established a progressive, regulated, and institutionally supportive environment for Web3 and digital asset development. *Stablecoins Bill* provide clear regulatory frameworks for virtual asset service providers, stablecoins, and real-world asset tokenization[3]. Under the *Government Green Bond Programme*, the Hong Kong Monetary Authority (HKMA) has pioneered tokenized green bonds, using DLT to streamline lifecycle management, settlement, and ownership verification. The *Digital Bond Grant Scheme* further incentivizes innovation by subsidizing eligible issuances up to HKD 2.5 million[4].

Recent developments underline that this is no longer only a sovereign-pilot theme. In June 2026, the HKMA convened a Tokenised Bond Expert Group to explore policy measures, market practices, and innovations for broader adoption of tokenised bonds[5]. The same month, the HKMC priced approximately HK$12 billion equivalent of inaugural public digital bonds, the largest-ever digital bond issuance globally at that time and the first digital bond issuance by a Hong Kong public sector entity other than the Government.The digital bonds are digitally created on a distributed ledger technology platform operated by the Central Moneymarkets Unit (CMU), shortening the settlement cycle from 5 business days to 3 business days[6].

Renewable energy asset tokenization has also been explored, enabling fractional ownership, improved liquidity, and transparent cash-flow monitoring. These practices demonstrate Hong Kong's supportive environment to deploy Web3 for sustainable finance.

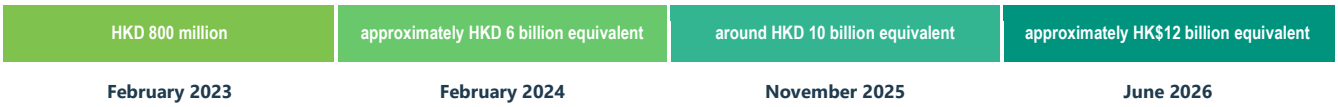
2.2 From Pilot Projects to Market Infrastructure

Hong Kong's progress in blockchain-based green finance has followed a clear sequence: proof of concept, live issuance, and then broader experimentation across asset classes. This progression can be seen in three major HKMA initiatives: Project Genesis, Project Evergreen, and Project Ensemble. Project Genesis tested whether tokenised green bonds and environmental data could improve transparency; Project Evergreen moved the model into live sovereign issuance and linked digital bonds with existing market infrastructure; and Project Ensemble now provides a supervised sandbox for cross-border, multi-asset tokenisation. The policy lesson is not the detail of each pilot, but the direction of travel: regulated tokenisation is becoming part of Hong Kong's capital-market infrastructure.

FIGURE 2 From pilot projects to market infrastructure

2.3 Case Study of HKSAR Digital Green Bonds

FIGURE 3 Hong Kong digital bond issuance milestones, 2023–2026



Hong Kong's digital green bond programme has developed in a clear three-stage progression, moving from an initial proof of concept in live markets to a more mature model of sovereign digital bond issuance. In February 2023, the HKSAR Government issued its first tokenised green bond under the Government Green Bond Programme, raising HKD 800 million with a one-year tenor after earlier groundwork under Project Genesis. This transaction was widely recognised as the world's first tokenised green bond issued by a government and demonstrated that a bond could be validly issued, cleared, settled, and held on distributed ledger technology under Hong Kong law. The issuance was placed with institutional investors and showed practical benefits such as faster settlement and reduced reliance on paper-based and manual processes. Regulators subsequently

published further guidance, helping establish a foundation for later digital bond transactions[7].

In February 2024, Hong Kong launched its second tokenised green bond, marking a significant step from experimentation toward broader market application. The offering totalled approximately HKD 6 billion equivalent and included tranches in HKD, RMB, USD, and EUR, making it the world's first multi-currency digital bond. The bonds were issued in native digital form on HSBC Orion and cleared and settled through the HKMA's Central Moneymarkets Unit, while investors could access the issuance either directly through the platform or through established international infrastructure linked to Euroclear and Clearstream. This structure broadened market participation and showed how digital issuance could work alongside conventional market channels rather than replace them entirely[8].

A particularly important feature of the 2024 issuance was its adoption of the International Capital Market Association's Bond Data Taxonomy(BDT)[9]. The Hong Kong Monetary Authority explained that one reason for choosing BDT was to improve traditional bond issuance processes, which still rely heavily on manual handling of documents and data and therefore remain time-consuming and prone to error.

By 2025, Hong Kong had signalled that tokenised bond issuance was no longer being treated simply as a pilot exercise. In November 2025, the HKSAR Government completed a third digital green bond issuance under the Government Sustainable Bond Programme, raising around HKD 10 billion equivalent across HKD, RMB, USD, and EUR. According to the Hong Kong Monetary Authority, this was the largest digital bond issuance globally to date. For the HKD and RMB tranches, investors could choose to settle the primary issuance using tokenised central bank money in the form of e-HKD and e-CNY in addition to conventional settlement arrangements. The issuance also obtained Digital Token Identifiers under ISO 24165 for all tranches, linked directly to the bonds' ISINs and the issuer's Legal Entity Identifier, while the use of ICMA's Bond Data Taxonomy was further expanded to support more complete machine-readable automation of issuance and green disclosure information[10].

2.4 Gaps in Green Finance Information Disclosure in Hong Kong

Despite progress, Hong Kong's green finance disclosure regime remains relatively fragmented. Four gaps stand out:

FIGURE 4 Four gaps in Hong Kong's green finance disclosure regime

Lack of standardised templates. No uniform, machine-readable templates exist across green bonds, loans, and funds, resulting in inconsistent metrics and limited cross-instrument comparability.

Point-in-time focus. Current rules emphasise issuance-stage disclosure but do not adequately require continuous reporting on the use of proceeds, performance against targets, or ongoing taxonomy alignment.

Reliance on static documents. Heavy use of PDF reports and narrative disclosures impedes automated data extraction and increases manual processing burdens for investors and regulators alike.

Weak taxonomy linkage. Connections between disclosed information and recognised classification systems—such as the Hong Kong Taxonomy for Sustainable Finance—remain underdeveloped, making it difficult to verify whether a "green" label corresponds to credible sustainability criteria. This also limits cross-border interoperability and constrains Hong Kong's potential role as a standards-translation hub.

These gaps hinder investment decisions, asset valuation, and regulatory efficiency.

2.5 Standardized Disclosure Practices in Mainland China's Capital Markets

In mainland China, XBRL-based reporting for listed companies and public funds has supported more efficient structured data processing[11]. Unified templates enable machine readability, reduce information costs, facilitate data sharing, and strengthen regulatory supervision[12]. This model illustrates how structured digital disclosure can help reduce information asymmetry, enhance transparency, and support capital-market development, offering valuable lessons for Hong Kong.

XBRL (eXtensible Business Reporting Language) is a standard for converting financial and sustainability disclosures into structured, machine-readable data. An XBRL information-disclosure template links each required field—such as the reporting entity, reporting period, bond identifier, use of proceeds, environmental indicator, measurement unit, calculation method, and assurance status—to a standard digital concept, allowing computers to extract, compare, and perform rule-based checks on the information while readers can still view it in a familiar format through Inline XBRL (iXBRL)[13] [14].

FIGURE 5 From disclosure fields to machine-readable reporting

REPORTING ENTITY	BOND IDENTIFIER	DIGITAL CONCEPT	RULE-BASED CHECKS	INLINE XBRL
reporting period	use of proceeds	environmental indicator	measurement unit	reader-friendly view

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3. PRIORITY GREEN RWA OPPORTUNITIES FOR HONG KONG

TABLE 1 SECTION 3 AT A GLANCE | Priority opportunities and conditions for scale

OPPORTUNITY	WHAT IT ENABLES	CRITICAL CONDITION
3.1 Digital green bonds & sovereign instruments	Embed XBRL impact reporting and on-chain taxonomy checks; publish open specifications and KPI dashboards for private adoption.	Maintain consistent impact data across the bond lifecycle.
3.2 Distributed green infrastructure	Pool and fractionate small, dispersed low-carbon assets; link cash flows and investor returns to measured outcomes.	Require credible MRV and alignment with the Hong Kong Taxonomy.
3.3 Carbon credits & environmental attributes	Track credits through metadata from issuance to retirement; pursue links with Mainland and international registries.	Require robust MRV, aligned methodologies and regulatory coordination.
3.4 Digital green ABS & cross-border securitisation	Pool granular green cash flows into tradable securities; carry use-of-proceeds, taxonomy and MRV data on-chain.	Resolve tax treatment and develop compatible legal and market infrastructure.

3.1 Digital Green Bonds and Sovereign Digital Instruments

Green bonds are the most mature segment of sustainable finance and the natural entry point for Web3 integration. Hong Kong's own tokenised green bond programme has already demonstrated this. Under Singapore's Project Guardian, the National University of Singapore, Northern Trust, and United Overseas Bank announced in January 2025 an initiative to tokenise the environmental-impact reporting credentials of NUS's S$340 million third green bond, which had been issued in 2023. The initiative did not tokenise or issue the bond itself; Northern Trust minted a reporting token containing the bond's impact data so that investors could receive a consistent dataset as the bond changed hands[15]. This integrity guarantee is especially valuable for sovereign instruments, where the credibility of environmental claims directly affects a jurisdiction's international standing.

Hong Kong's opportunity is to build on its digital green bond programme by embedding open disclosure standards into the bond architecture: XBRL-structured impact reporting, on-chain taxonomy alignment verification, and standardised environmental KPI dashboards. Publishing these technical specifications as a public good would accelerate private sector adoption.

3.2 Distributed Green Infrastructure

Distributed green infrastructure, including rooftop and distributed solar, building energy-efficiency retrofits, EV charging networks, electric public transport, and related low-carbon mobility assets, represents one of the clearest use cases for tokenised real-world assets. These assets share a common financing problem: they generate long-term, relatively stable cash flows and carry strong ESG value, yet they are typically too small, dispersed, or performance-dependent to suit conventional project finance, bank lending, or public-market vehicles such as REITs. In traditional finance they often remain accessible only to large institutional investors, and secondary markets are limited.

Tokenisation can help address these barriers by enabling fractional ownership, pooling multiple small projects into diversified portfolios, improving secondary-market liquidity, and allowing cash flows to be tracked transparently. The model is already operational at scale: in Europe, more than €50 million of real estate has been tokenised, with over €1 million in rental income distributed directly to token holders[16]. Although this example comes from real estate, it demonstrates that tokenised, income-producing assets can work in practice. The same mechanics extend naturally to green infrastructure. Small and medium-sized solar projects can be pooled into tokenised portfolios offering diversified exposure to solar cash flows. Verified energy savings or emissions reductions from building retrofits can be turned into performance-linked tokens, with smart contracts tying investor returns directly to measured outcomes. EV charging stations and related mobility assets can be structured as tokens representing rights to a share of usage-fee or availability-payment revenues, with utilisation and electricity-source data feeding directly into impact reporting.

What unites these structures is the role of on-chain measurement, reporting, and verification (MRV). On-chain MRV of power generation, energy savings, utilisation, and associated emissions reductions, combined with taxonomy-aligned disclosure, can give investors greater confidence in both financial performance and environmental integrity while reducing disputes over performance.

For Hong Kong, the opportunity is significant. The city has a large stock of commercial and residential buildings requiring decarbonisation, many underfinanced distributed solar projects, and a growing need to finance low-carbon

transport. Tokenised green-infrastructure vehicles could complement existing green loans and sustainability-linked loans by offering more detailed visibility into real-world impact, and could help coordinate low-carbon transport and greener trade. To be credible, however, these structures would need to align closely with the Hong Kong Taxonomy and local MRV requirements and taxonomy-aligned disclosure standards. They could also support Hong Kong's broader role in mobilising climate-related investment flows between Mainland China, ASEAN, and Belt-and-Road economies.

3.3 Carbon Credits and Environmental Attribute Markets

Carbon credits and other environmental attributes, such as renewable energy certificates, biodiversity credits, and water rights, are among the most data-intensive instruments in sustainable finance. They are also highly vulnerable to fraud, double counting, and weak market integrity. Registry systems remain fragmented across jurisdictions, verification methods are uneven, and the ownership history of individual credits is often hard to trace in secondary markets.

Distributed ledger technology is well suited to this problem. By tokenising each credit with embedded metadata, such as project type, vintage, methodology, verifier, and retirement status, blockchain can create a tamper-resistant record of the asset's full lifecycle from issuance to retirement. This matters because the voluntary carbon market continues to face growth constraints, largely because of integrity concerns that better tracking and verification could help address.

For Hong Kong, a DLT-based registry or market infrastructure that is interoperable with Mainland China's national carbon market and international voluntary credit registries could strengthen the city's position as a regional climate-finance hub. Tokenised carbon credits and related environmental attributes could also make cross-border carbon trading more transparent and efficient, provided that all tokens are anchored in robust MRV standards and taxonomy-aligned methodologies. To succeed, this approach would require close coordination with Mainland authorities and international standard-setters to ensure both compatibility and credibility.

3.4 Digital Green ABS and Cross-border Securitisation

A further opportunity is digital green asset-backed securities (ABS). Securitisation offers a complementary response to the liquidity constraint that runs through the asset classes above. By pooling granular green cash flows from distributed solar, building retrofits, EV charging, or green loans into asset-backed securities, issuers can turn small, illiquid exposures into tradable instruments with broader investor reach. Blockchain can reinforce this model: tokenised green ABS can carry use-of-proceeds, taxonomy-alignment and MRV data on-chain, improving transparency over the underlying pool and easing the heavy servicing and reporting burden of conventional securitisation.

This direction also aligns with live market initiatives. The Asia Pacific Structured Finance Association (APSA) has proposed an initiative to establish a cross-border securitisation market that uses Hong Kong special-purpose vehicles to diversify international participation in the Mainland's fixed-income and securitisation market. Taxation treatment remains a significant hurdle, but digital, blockchain-enabled green ABS — pairing Hong Kong's "orphan" special purpose vehicles (HK SPVs) and legal infrastructure with on-chain disclosure — is a promising area for further research and policy dialogue[17].

Integrated Implication for Hong Kong

Taken together, these four asset classes show that Hong Kong's opportunity is not limited to tokenising green assets for fundraising. Its greater strategic value lies in building trusted market infrastructure: structures that combine tokenisation, strong disclosure, reliable MRV, structured securitisation pathways and cross-border interoperability. If designed well, such platforms could help channel capital into real decarbonisation projects while reinforcing Hong Kong's role as a regional centre for sustainable finance and green trade.

FIGURE 6 Four priority green RWA opportunities

3.1 DIGITAL GREEN BONDS & SOVEREIGN INSTRUMENTS

Maintain consistent impact data across the bond lifecycle.

3.2 DISTRIBUTED GREEN INFRASTRUCTURE

Require credible MRV and alignment with the Hong Kong Taxonomy.

3.3 CARBON CREDITS & ENVIRONMENTAL ATTRIBUTES

Require robust MRV, aligned methodologies and regulatory coordination.

3.4 DIGITAL GREEN ABS & CROSS-BORDER SECURITISATION

Resolve tax treatment and develop compatible legal and market infrastructure.

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4. CHALLENGES TO ADOPTION

Technology alone does not determine outcomes. In selected use cases, Web3 infrastructure for green finance is mature enough for institutional deployment. Yet adoption remains slow, fragmented, and concentrated in a small number of pioneer jurisdictions and issuers. The reasons are not purely technical; they reflect a set of connected barriers spanning asset integrity, data quality, regulation, market structure, and institutional capacity.

TABLE 2
SECTION 4 AT A GLANCE | Adoption barriers and practical responses

ADOPTION CHALLENGE	WHY IT MATTERS	WHAT ADOPTION REQUIRES
4.1 Asset integrity & greenwashing	Tokenisation cannot compensate for weak assets or verification; code can obscure environmental substance.	Use high-quality eligible assets, plain-language disclosure, robust taxonomies and credible MRV.
4.2 Data quality & MRV infrastructure	Tamper-resistant records can still contain inaccurate inputs; weak off-chain data undermine trust.	Build end-to-end MRV with sensors, independent verifiers, trusted data providers and dispute governance.
4.3 Legal & regulatory uncertainty	Unclear token status, custody and investor rules raise costs; smart-contract recourse remains unsettled.	Develop clear, proportionate and interoperable rules for cross-border classification and enforcement.
4.4 Platform fragmentation & interoperability	Incompatible platforms create siloed liquidity, duplicate registries and difficult market-infrastructure integration.	Adopt common standards, credible bridging and links to custody, payment and settlement systems.
4.5 Standardisation deficits	Missing structured templates limit automation and comparability; divergent taxonomies weaken consistent labelling.	Use mandatory machine-readable fields, wider Hong Kong Taxonomy adoption and cross-jurisdiction alignment.
4.6 Capacity, costs, liquidity & perception	Skills scarcity and early-stage costs burden smaller issuers; thin liquidity and crypto-linked scepticism slow adoption.	Provide training and open guidance, anchor regulated use cases and communicate benefits and risks clearly.

4.1 Integrity of Underlying Assets and Greenwashing Risks

Tokenisation can strengthen trust only when the underlying assets are credible. If project-level data, governance, or verification are weak, putting assets on-chain does not solve the problem; it can simply scale mistrust more quickly. Existing tokenised carbon markets illustrate this risk, with persistent concerns over uneven credit quality, limited additionality, and inconsistent verification standards, all of which weaken confidence in on-chain green assets.

Web3 can therefore reduce greenwashing, but it can also create new forms of it. Smart contracts can encode compliance rules with precision, yet that same precision can be used to meet the letter of an obligation while obscuring its environmental purpose. Tokens can carry misleading green labels just as easily as traditional certificates. A further risk is technical opacity: if the environmental obligations embedded in a token can only be interpreted by blockchain specialists, ordinary investors and even regulators may struggle to judge whether those obligations are meaningful in substance.

This makes plain-language disclosure essential alongside on-chain records and smart contract governance. It also highlights the need for regulators to treat code, in effect, as a form of disclosure that may require scrutiny. Without robust taxonomies, credible MRV systems, and careful rules on which assets and credits are eligible for tokenisation, Web3 may become another channel for greenwashing rather than a solution to it. For Hong Kong, an integrity-first approach—starting with high-quality assets aligned with recognised taxonomies and MRV standards—is therefore critical.

4.2 Data Quality and MRV Infrastructure

The value of on-chain disclosure depends on the quality of the off-chain data that feeds it. Blockchain can ensure that recorded data are tamper-resistant after entry, but it cannot confirm whether the data were accurate in the first place. This is the core of the oracle problem: real-world information, such as emissions data, energy generation figures, or disbursement records, must still be collected, verified, and transmitted by actors outside the blockchain.

If these data feeds are inaccurate, delayed, or manipulated, then on-chain records may be immutable but still wrong. In that case, the promised gains in transparency and trust are undermined. This problem is especially acute in green finance, where environmental impact measurement remains uneven, climate-related monitoring infrastructure is still limited in many markets, and the independence of verification bodies is not always assured.

Hong Kong's current disclosure regime adds to this challenge because it still relies heavily on static PDF documents, which hinder automated data extraction and analysis. As a result, DLT-based governance cannot deliver its full benefits unless the broader disclosure chain is redesigned—from project-level data collection to investor reporting.

Building credible MRV infrastructure therefore requires more than blockchain adoption. It requires investment in sensors, verification protocols, trusted data providers, and governance arrangements for oracle operation and dispute resolution. For cross-border green projects, Hong Kong will also need to work closely with Mainland and international partners to ensure that MRV and oracle systems meet high integrity standards across jurisdictions.

4.3 Legal and Regulatory Uncertainty

Legal uncertainty remains one of the most important barriers to scale. Although Hong Kong has moved relatively quickly on virtual asset regulation and stablecoins, many jurisdictions still lack clear rules on the legal status of tokens, custody arrangements, investor protection, and the treatment of tokenised instruments under existing financial law.

This uncertainty raises compliance costs and discourages traditional financial institutions from engaging deeply with Web3-based green products. Even where the technology is workable, institutions are unlikely to commit capital at scale if they are unsure whether a token will be treated as a security, a collective investment scheme, or another regulated instrument, or how disclosure, suitability, and prudential requirements will apply.

Three areas are especially important. First, the legal classification of tokenised green bonds differs across jurisdictions, creating major cross-border compliance burdens in a market where capital is inherently international. Second, smart contracts introduce unresolved questions of enforceability and recourse—for example, when an automatic payment or penalty is triggered by data that later proves inaccurate. Third, large-scale cross-jurisdictional enforcement of on-chain obligations is still largely untested, which is a serious concern for green finance instruments that often involve multiple legal systems.

Clear, proportionate, and internationally interoperable regulation is therefore essential. Without it, adoption will remain limited to pilots and isolated transactions rather than becoming part of mainstream green finance markets.

4.4 Platform Fragmentation and Interoperability

The current Web3 landscape is fragmented across multiple blockchains, token standards, and proprietary platforms that do not interoperate smoothly. In green finance, this fragmentation creates siloed liquidity, duplicative registries, and difficulty tracking the same asset or credit across different systems.

This problem is already visible across major initiatives. Hong Kong's Project Evergreen, Singapore's Project Guardian, EU distributed ledger pilots, and various private platforms have each developed under different technical standards, token formats, and governance models. For a global market in tokenised green finance to function effectively, assets and data must move across these systems with minimal friction. Without that portability, instruments issued in one ecosystem cannot be efficiently held, traded, or reported in another.

Pilot projects have explicitly identified this as a structural constraint. Scaling beyond experiments requires both technical interoperability and greater regulatory consistency across jurisdictions. For tokenised bonds and other RWAs, fragmentation also complicates integration with existing market infrastructure, including central securities depositories, payment rails, and custody systems.

Hong Kong should therefore prioritise interoperability from the outset. That means supporting common standards, credible bridging arrangements, and clear expectations for custodians and market infrastructures, rather than allowing a patchwork of incompatible pilots to emerge.

4.5 Standardisation Deficits

A related barrier is the lack of common, machine-readable disclosure standards. Even with blockchain infrastructure in place, automated and comparable environmental reporting remains difficult if issuers do not use structured templates with mandatory data fields for use of proceeds, emissions reductions, taxonomy alignment, and third-party verification.

This standardisation gap extends beyond disclosure formats to green taxonomies themselves. Different jurisdictions use different definitions and classifications, and although crosswalk efforts such as the EU-China Common Ground Taxonomy have improved comparability, alignment remains incomplete. In Hong Kong, the underuse of the Hong Kong Taxonomy for Sustainable Finance has contributed to inconsistent green labelling and weaker market credibility.

Without stronger standardisation, tokenisation may improve record-keeping but still fall short of enabling meaningful comparability, automation, and investor trust.

4.6 Capacity, Costs, Liquidity, and Public Perception

Institutional capacity is another major constraint. Regulators, public financial institutions, and many traditional

intermediaries still have limited Web3 expertise, making both supervision and adoption more difficult. Smart contract and blockchain specialists are scarce and expensive, so institutions must either build in-house capability or depend on external technology providers whose incentives may not always align with regulatory or environmental goals.

These challenges are not only technical but economic. Tokenisation can involve additional costs compared with traditional issuance and reporting, especially in the early stages when standards, service providers, and secondary market liquidity are still developing. The burden is particularly heavy for smaller issuers—such as municipalities, development finance institutions, and community-scale clean energy projects—that lack the resources to manage technical integration, legal structuring, and compliance at the same time.

Market liquidity remains limited as well. Because tokenised green instruments are spread across competing platforms, network effects have not yet been strong enough to create deep and active markets. Until scale is reached, even well-designed systems may struggle to demonstrate their full value to issuers and investors.

Public perception also matters. Much of the public still associates crypto with volatility, fraud, and speculative excess, and that scepticism can spill over into attitudes toward Web3 more broadly—even when the use case involves regulated, asset-backed green finance rather than speculative trading. Addressing this requires sustained training, clearer distinction between speculative crypto activity and Web3 as market infrastructure, and careful communication of both benefits and risks.

Hong Kong's public sector is well placed to lead this effort by anchoring Web3 deployment in high-integrity green projects, regulated institutions, and clearly supervised use cases.

5. WHAT CAN THE PUBLIC SECTOR DO: POLICY OPTIONS

5.1 Technological Empowerment and Process Standardization

Establish a working group led by the Securities and Futures Commission (SFC) to explore and evaluate how to integrate XBRL-equivalent data treatment technology into the disclosure rules for green finance products.Web3 and DLT should be adopted for on-chain recordation to ensure data immutability, traceability, and auditability.

Unified, machine-readable disclosure templates should be developed for green bonds, funds, loans, and asset-backed securities, with mandatory fields for key metrics such as use of proceeds, emission reductions, taxonomy alignment, and third-party verification. Regulatory guidance and sandboxes can lower participation barriers. This hybrid framework will substantially improve disclosure quality and transparency.

5.2 Enhanced Adoption of Hong Kong Green Taxonomy

As part of information disclosure optimization, regulators may consider mandate explicit alignment with the *Hong Kong Taxonomy for Sustainable Finance*. Products can be required to disclose taxonomy categories, compliance thresholds, supporting evidence, and alignment status. Where a product is not aligned to any recognised taxonomy, issuers must explain why and set out the measures taken to prevent greenwashing.Standardized green labeling will reduce greenwashing risks and strengthen Hong Kong's global green finance reputation.

5.3 Scale the Government Digital Green Bond as a Standards Platform

The HKSAR Government's digital green bond programme is among its most powerful instruments for advancing Web3 green finance infrastructure. Future issuances must embed XBRL-structured impact reporting, on-chain taxonomy alignment verification, and standardised environmental KPI dashboards, with resulting technical specifications published as open standards for private sector adoption. Expanding the programme in scale, frequency, and technical sophistication would crowd in private issuers and progressively raise the benchmark for institutional-quality Web3 green finance.

5.4 Invest in Environmental Data Infrastructure

The integrity of on-chain green disclosures ultimately depends on reliable data at the physical level. Governments can prioritise investment in public environmental monitoring infrastructure, such as IoT sensor networks, standardised emissions measurement methodologies, and independent climate data registries — that serve as trusted oracle sources for green finance smart contracts. This includes developing interoperability standards for monitoring devices, creating legal frameworks for using government-maintained datasets as authoritative inputs to financial reporting, and exploring cross-border data-sharing arrangements within the Greater Bay Area.

5.5 Capacity Building and Market Participation Support

Public sector capacity building can significantly lower the adoption barrier for smaller issuers. The existing Digital Bond Grant Scheme, offering up to HKD 2.5 million per eligible issuance, provides a replicable model that could be extended in both scope and scale. Complementary measures such as publishing open technical guidance on smart contract architectures for green bonds, training regulatory staff in blockchain assessment, and supporting industry associations in developing common contractual standards would reduce the coordination costs that currently concentrate Web3 green finance activity among a small number of large institutions.

6. CONCLUSION

Web3 technologies can improve data integrity, traceability, and real-time access to information, giving them strong potential to raise disclosure quality and market transparency in green finance. When combined with structured reporting and clear taxonomies, Web3 offers Hong Kong a practical path to move from fragmented, PDF-based disclosure toward a more transparent, programmable, and interoperable digital finance infrastructure.

Hong Kong already has a solid foundation, including tokenised green bond initiatives, digital asset regulation, and the Hong Kong Taxonomy, and newly established policy platforms such as the Tokenised Bond Expert Group. However, important gaps remain in disclosure standardisation, lifecycle governance, and the integration of taxonomies into product-level reporting. To address these gaps, Hong Kong should adopt an infrastructure-focused strategy that links XBRL-like reporting with on-chain record-keeping, develops unified disclosure templates, promotes taxonomy-aligned reporting, and invests in public digital infrastructure. If supported by careful asset selection, clear regulation, and sustained capacity building, these steps could help expand, de-risk, and decarbonise capital flows, while positioning Hong Kong as a leading hub for tokenised green assets by 2030.

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