

# Building compliant and comprehensive tokenization solutions across traditional and new asset types

## An overview of Project Genesis: a green bond issuance platform

As more securities move to distributed ledger technology (DLT) platforms, effective asset tokenization holds the key to transforming issuance, settlement, custody, and asset-servicing processes in financial services. The benefits of such digitization are clear—corporate actions and complex lifecycle management of regulated assets have long been major pain points across the industry, imposing a heavy operational load and substantial risk on players across the capital markets ecosystem. Digital Asset partnered with GFT, the Bank for International Settlements (BIS), the Hong Kong Monetary Authority (HKMA), and an extensive advisory panel, to develop Project Genesis, a green finance project driven by innovations in asset tokenization and its underlying technologies to improve efficiencies in the distribution of green bonds, as well as to facilitate more insightful reporting on the environmental impact of green bond proceeds.



### An overview of asset tokenization

Tokenization refers to the creation of a unique, digital representation of an asset so that it can be traded on a DLT or blockchain platform. Any type of asset can be tokenized—from physical assets like artwork and real estate to intellectual property and intangible assets (e.g., frequent flyer miles). A token should represent a redeemable claim to a security and derives its value from that claim. Holding the token is equivalent to owning a claim to the asset and ownership of the claim should be freely transferable.

Tokenization offers two fundamental advances over the landscape of already-digital dematerialized assets built with historic tech stacks. First, the capacity to bake full lifecycle automation onto the tokenized asset itself, including the rights and obligations of each of the ecosystem of participants across the market throughout the life of the asset; and second, the opportunity to wire traceability and provenance into the asset.

Essentially, any type of asset can be tokenized and deliver material benefits. It was with this mindset that inspired the Project Genesis team to build a proof of concept for bringing greater efficiency and transparency to the end-to-end green bond issuance and lifecycle workflow.

### A vision to revolutionize green bond issuance

The Project Genesis proof of concept was able accomplish the following objectives by effectively tokenizing green bonds and following an innovative approach to the underlying infrastructure:

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**Improve efficiency across the end-to-end bond issuance lifecycle**
- 
**Ensure licensed institutions comply with current regulations**
- 
**Create a reference application for the design and implementation of a production-grade system**
- 
**Increase transparency and ensure delivery of ESG covenants to better showcase green impact**

Through Project Genesis, DLT, Daml, and IoT technologies worked together to provide a real-time trading platform for green bonds that promotes ecologically conscious trading.

# A transformative green bond platform using blockchain, smart contracts, and IoT to empower retail investors, achieve Hong Kong’s green targets, and explore the possibilities of a new financial ecosystem

With an influx of green bond programs aiming to support global climate initiatives, businesses require a more transparent and real-time capability for communicating the delivery of environmental, social, and corporate governance (ESG) covenants to regulatory bodies and investors. Thankfully, tokenization offers a radical breakthrough here.

By combining a tokenized financial asset with a data stream (like a feed from IoT metering devices attached to a solar farm) or workflow (for example, audit and confirmation that no deforestation has occurred in the production of a commodity, or certification that a energy efficiency upgrade has occurred to a certain standard), there is for the first time the capacity to have ESG linked assets with built-in, real-time reporting.

The first phase of Project Genesis—together with GFT, AllInfra, the Bank for International Settlements (BIS) Innovation Hub, and in collaboration with the Hong Kong Monetary Authority (HKMA)—developed a Daml-based prototype with the goal of improving efficiencies in the distribution of green bonds and facilitating direct, real-time reporting on their environmental impact down to the individual bond holder. BIS was able to construct tokenized bond models that drive two major value propositions:



**Capturing bond lifecycle events:** Origination, issuance, subscription, allocation, coupons, redemptions, and secondary-market trading were baked onto the bond token itself, enabling end-to-end automation of the issuance and lifecycle process for the bond.



**Traceability:** Bond tokens were enriched with the provided green data feed, enabling real-time traceability to any investor of the direct green impact of their investment—something otherwise not possible today.

Daml was critical to the success of this project for the following reasons:

1. Daml is a unique application development platform and smart contract language for building and executing sophisticated, multi-party workflows, and builds on the innovations of smart contracts and DLT.
2. With Daml, any asset class can be accurately tokenized as the bundle of rights and obligations for all parties within a specific ecosystem and across the full lifecycle of that asset, with appropriate regulatory and compliance guardrails in place.
3. Daml embeds the building blocks of rights and obligations directly into assets and can be used to create role contracts defining what specific parties may do within an ecosystem or a particular asset.
4. Daml uses rights and obligations to model shared workflows and fully automate complex, multi-party processes.

Using Daml to tokenize green bonds, Project Genesis provides for the structural representation of cash flows, events, and rights and obligations of the ecosystem of participants, enabling a complete model of the functionality of the asset on chain.

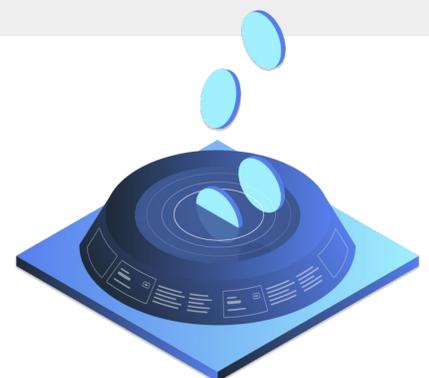
## A blockchain-based infrastructure and Daml’s privacy-first features

In Hong Kong, the retail bond subscription and payment process takes up to 28 days. This delay is largely due to the Hong Kong Monetary Authority and associated placing agencies reconciling application and subscription data from the same investor. The Project Genesis prototype aimed to solve many of these inefficiencies.

From a distribution point of view, the prototype enabled all placing institutions to synchronise their positions in real-time via the blockchain infrastructure. Banks could validate a client’s subscription almost instantly rather than waiting for final allotment results after closing.

Additionally, by utilizing a blockchain-based infrastructure, real-time sharing of the latest subscription list among all placing institutions was enabled, preventing the same investor from subscribing with multiple banks. At the same time, it is critical for banks to preserve their clients’ data without sharing across untrusted systems. Daml’s privacy-preserving features allowed that data sharing while preserving the clients’ data.

Daml also protects sensitive client data between the various agency systems and also provides confidence that the allocation of tokenized assets is done fairly via the smart contract. All of this comes together to achieve Project Genesis’s goal of efficiency and democratization of green bonds in the Hong Kong market.



## Technologies used across the Project Genesis prototype

The Project Genesis prototype incorporates the following technologies to revolutionize the the issuance of green bonds:

- **Blockchain:** A distributed ledger platform running on Hyperledger Besu and Hyperledger Fabric provides a golden source of truth while also enabling multiple parties to transact in real-time with enforced processes via smart contracts.
- **Daml multi-party application platform:** The Daml smart contract language and multi-party application development platform enabled the tokenization of any asset class and automation of complex workflows through its innovative smart contract framework.
- **Canton privacy-enabled blockchain layer:** With Daml, businesses have access to Canton, a privacy-enabled blockchain that complements other blockchains by enabling participant nodes to join one or many domains while also protecting privacy with the benefits of a golden source of truth and straight-through processing.
- **Internet of things:** Allinfra's IoT platform implemented a data capture, storage, and access system alongside the tokenized green bond.

### Benefits achieved through the Project Genesis green bond prototype



#### Synchronization of subscription records

Project Genesis synchronizes investor bond subscription records across placing institutions and HKMA's central money market units (CMU), and eliminates subscription failure that is currently at 1 percent, while achieving a reduction of subscription and closing periods.



#### Simulates fully tokenized bonds

The solution successfully simulates a fully tokenized bond through its preparation, subscription, settlement, secondary trading, and lifecycle management cycle on a Daml-enabled smart contract running across a distributed ledger platform.



#### Real-time updates to beneficial owners

The ultimate beneficial owner of the government bond receives real-time updates; all HKMA and HKEX network members receive this benefit along with shortened transaction times from T+2 to T+1, as well as the elimination of settlement failure.



#### Traditional and atomic settlement

Project Genesis allows for traditional, fiat-based settlement, as well as atomic DvP settlement by using native, on-ledger coupon-based payment modes (e.g., stablecoins to eliminate counterparty risk and increase settlement efficiency).



#### Access to green impact data and reporting

Investors have access to green impact data via the prototype with verifiable data provided in real-time via Allinfra's IoT platform. In addition to this real-time data stream, Project Genesis integrates with a prototype app of Hong Kong's largest stored value facility, Octopus.



#### Harmonizing records between participants

The prototype harmonizes subscription records among the HKMA network participants including HKMA's central money market unit (CMU) as the depository, the co-arrangers who manage the underwriting of the government bond, and the placing institutions—replacing traditional operations that use emails and manual communication.

# The Bank for International Settlements and the Hong Kong Monetary Authority are partnering with global organizations to revolutionize financial systems

While this prototype is improving transparency and efficiency on issuance and the use of green bond proceeds, it is also cutting down the retail green bond subscription and delivery process.

Project Genesis demonstrates that digital assets residing on blockchain can enhance efficiency by shortening bond settlement from T+2 to near real-time, while also connecting the segregated order books managed by multiple banks and brokers. The Hong Kong Stock Exchange (HKEX) has also begun initiatives to encourage transparency and traceability reporting to answer industry concerns about “green washing,” and they are putting to use the valuable lessons from Project Genesis to support future projects.

In addition to improved reporting, citizens in Hong Kong will now have the ability to use a mobile application to start investing in tokenized assets with as little as 100 HKD while still accessing the secondary market for liquidity.

Project Genesis is guided by a panel of experts in environmental, social, and governance specialties to ensure success across the Hong Kong financial ecosystem and to ultimately drive meaningful impact on global environmental change.



To learn more about this innovative prototype, go to [bis.org](https://bis.org) to download the full report or contact Digital Asset.

Project Genesis is powered and sponsored by the following organizations:



## Digital Asset

Digital Asset is a software and services provider that helps enterprises build economic value through interconnected networks. The company designs and delivers technology that reshapes legacy systems and workflows into efficient, secure, and interconnected applications. Daml, our core technology, is a platform for building multi-party applications. It extracts and simplifies business processes to make data accessible and optimizes workflows using smart contracts. Leading organizations across financial services, insurance and healthcare partner with Digital Asset to create new multi-party solutions that transform disparate silos into synchronized networks.

Learn more and view additional case studies at [digitalasset.com](https://digitalasset.com), or

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