

┌ The immutable green

Blockchain redefines
green bonds management



Executive summary



Sustainable finance is an urgent global priority. At a recent G7 Summit, world leaders emphasised the need to “green the global financial system so that financial decisions take climate considerations into account”.¹ The EU Sustainable finance action plan (2018) that led to the Green Deal, and regulators all over the world are working on redirecting capital into sustainable investing. Project Genesis, the subject of this paper, was showcased at COP26, possibly the most important climate summit globally.

The global financial system faces many challenges as it transitions to make green investment the norm. Investors and other stakeholders must be assured that investments are used to support genuinely green projects, which can be difficult to define. In practice there are many shades of green and it is important to protect against ‘greenwashing’.

So what does green finance mean? This paper introduces the elements of green finance with a focus on green bonds. It summarises the technical challenges of green bonds issuance, managing the debt lifecycle and communicating with stakeholders. More importantly it proposes how modern technologies, including blockchain, offer a strategic solution to these challenges.

The paper introduces Project Genesis,² a transformative green bond issuance and trading platform, built in conjunction with the Bank for International Settlements and the Hong Kong Monetary Authority, and delivered by

GFT in partnership with Digital Asset. Genesis shows the art of the possible by combining blockchain, smart contracts, internet-of-things, and digital assets to drive efficiencies in the distribution of green bonds and to generate accurate reporting on the environmental impact of green bond proceeds.

Genesis heralds a new era of green investment based on automation and total transparency and proposes a new financial product for retail investors. All investors – whether retail or wholesale – can be confident that funds are being used for sustainable projects. It also lays the foundation for wider adoption of distributed ledger technology, Daml and IoT platforms to develop similar solutions to the green finance challenge.

¹ Policy paper, G7 Finance Ministers and Central Bank Governors Communiqué, 5 June 2021

² https://www.bis.org/about/bisih/topics/green_finance/green_bonds.htm

01. Sustainable finance — a great global ambition

Across the globe, companies are accelerating sustainable finance projects. Asset managers are divesting from companies that do not meet their sustainability criteria, while central banks incorporate climate change risks into discussions. But there is often doubt about what is meant by sustainable or 'green' finance and there appear to be several shades of green. In the absence of standards, companies can easily be accused of 'greenwashing'. So what does green finance mean?

The European Commission summarises the aims of sustainable finance:

“Sustainable finance refers to the process of taking environmental, social and governance (ESG) considerations into account when making investment decisions in the financial sector.”³

³ https://ec.europa.eu/info/business-economy-euro/banking-and-finance/sustainable-finance/overview-sustainable-finance_en



01.1 Why green bonds?



Green finance provides a communications language between the environment, finance and investment. Related terms include, responsible investment (RI), environmental, social and governance (ESG), sustainable finance and climate finance.

Although there are many facets of green finance, green bonds are a critical component that is growing in importance and popularity. Global green bonds issuance accelerated to over \$500bn in 2021 and maintains the trend of 10 consecutive years of green market expansion.⁴

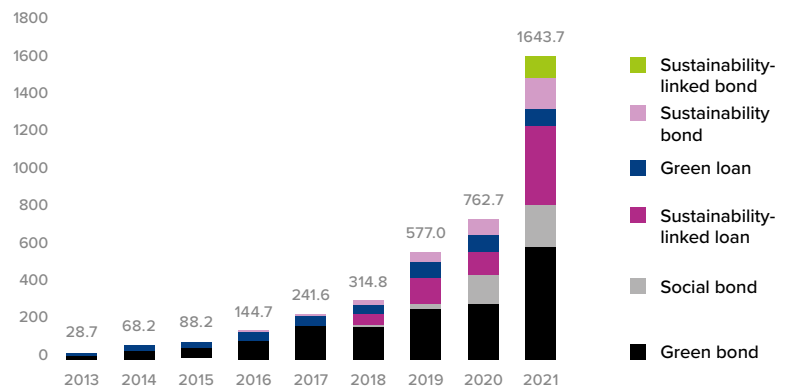
01.2 How green bonds support ESG



Green bonds are issued by companies that either provide goods and services that reduce carbon emissions or currently operate at net zero - and can demonstrate this through related data. Although green bonds are an element of the drive towards ESG, the two are not synonymous, since ESG is more of an umbrella term for an overarching green agenda. In practice, green bonds are more precisely defined by the impact they deliver in terms of sustainability and what can be measured.

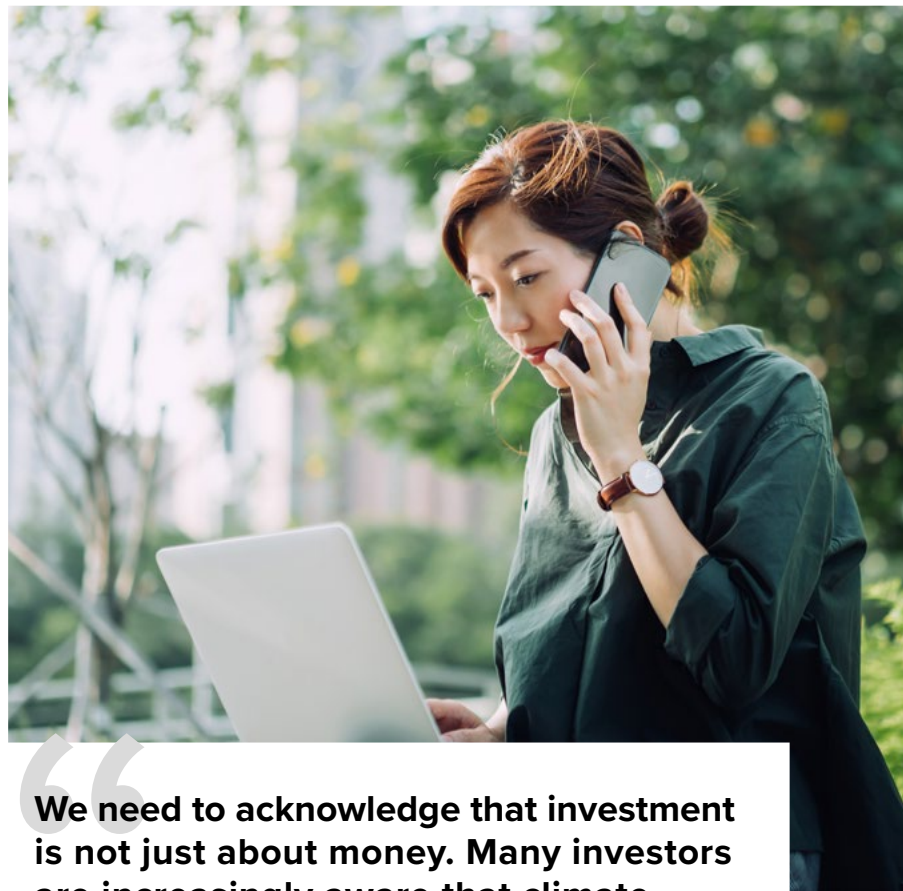
The aim of green bonds is to mitigate climate change and to support environmentally friendly projects. From an investor perspective, green bonds often come with tax incentives, such as exemptions or tax credits which make them financially attractive, helping to direct investment towards green projects. To prove authenticity, a green bond is normally verified by a third party, such as the Climate Bond Standard Board, which certifies that the bond will fund projects that include benefits to the environment.

As sustainability moves centre stage, green bonds become an important option for investors. To support this move, regulators encourage signposting the 'green-friendliness' of funds. For example, in Europe, all funds are rated using a traffic light system defining their sustainability level. While there is no defined common ESG rating, companies are taking the issue seriously and some have set strict carbon neutral targets.



Infographic:
Sustainable debt annual issuance

Source:
BloombergNEF,
Bloomberg LP




“We need to acknowledge that investment is not just about money. Many investors are increasingly aware that climate change is the biggest challenge we face today, and investment strategies must reflect this.”

Daniela Kielmann, GFT ESG expert

⁴ <https://www.climatebonds.net/2022/01/500bn-green-issuance-2021-social-and-sustainable-acceleration-annual-green-1tn-sight-market>

02. Universal green bond challenges

For investors, green bonds are an opportunity to align finance with environmental goals. However, the global industry faces some challenges



SHADES OF GREEN. There is not a universally accepted legal definition, meaning there can be different ‘shades’ of green. Usually, the issuer will determine specific use for proceeds raised; however, issuers tend to use their own definitions and there can be a lack of consistency and detail. In many cases, an investor must look to post-issuance reporting to see what its money was in fact used for.

MULTIPLE STAKEHOLDERS. There are good reasons to issue green bonds, and many are rooted in corporate social responsibility (CSR) policy. In practice there are always multiple stakeholders, including investors, shareholders, employees and customers, who may have different objectives.

In some cases, a green issuance is the culmination of a thorough impact strategy. In others it is intended to boost the company’s image or raise new funds to accelerate sustainable initiatives. While these objectives may seem similar, individual stakeholders can become cynical about the objectives of a green bond and negative publicity is easily generated.

COMPLEX DATA FROM MULTIPLE SOURCES. Green bonds issuers must source, manage and distribute a growing volume of data from multiple sources. Problems often arise because of an absence of relevant data, its reliability, and how the data is interpreted.

The existence of very different ratings for the same company from different rating agencies is evidence of this. Being transparent and providing the underlying accurate raw data is essential to ensure a consistent rating.

Investors in green bonds should also be aware that they are often defined as ‘green’ solely by the projects which they finance, not the broader activities of the issuer, its partners, or other members of its supply chain which may, or may not have the same green status. It can be easy to make accusations of ‘greenwashing’.

DIFFERENT COMPLEX TECHNOLOGY STACKS. The foundation for the green bond market is that proceeds of the bond are used exclusively to finance green projects. All stakeholders need to exchange information digitally and preferably in real-time to have the best ability to track the use of the investment. In practice this is limited by the disparate nature of technology, the manual nature of reporting data, and the different generations of technology being used by stakeholders.

In summary, many of the challenges around green bonds relate to data, including:

- Quality
- Timeliness
- Fragmentation

The value of green bonds depends on the quality and provenance of the data used to create the product. This often requires manual collation and processing of data from multiple sources, for example reviewing the efficiency of a wind or solar farm in generating green energy.

03. Technology brings a good idea to life



Green investment presents a massive information challenge. But modern technologies can empower organisations to capture, store and distribute accurate real-time information to ensure investments meet the required criteria to qualify as ‘green’.

Blockchain and distributed ledger technology will transform the management of green bonds, ensuring all participants share the same data in real time. And because all data is immutable, provenance of green data is assured.

Project Genesis, which was unveiled at Hong Kong Fintech Week 2021, and subsequently showcased at COP26, demonstrates why green bonds have a bright future.

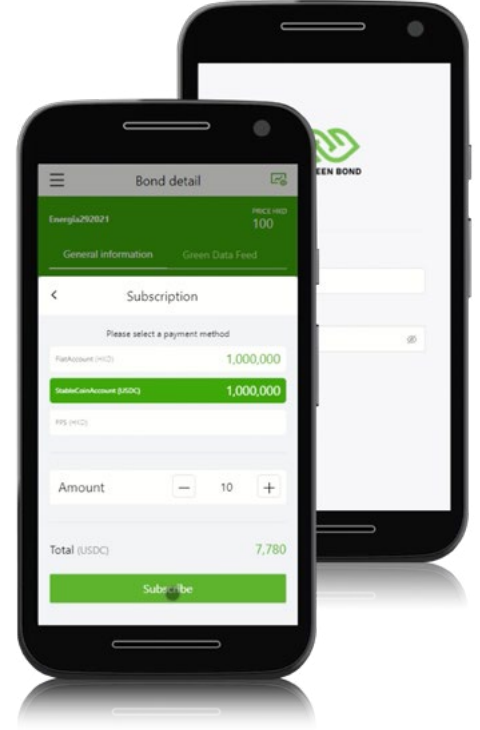


03.1 Project Genesis – a new beginning for green bonds management



In October 2021, the Hong Kong government announced Hong Kong’s Climate Action Plan 2050, setting out the vision of ‘Zero-carbon Emissions’ building on the previous 2017 plan, targeting a 65-70% reduction in carbon intensity by 2030 compared with the 2005 levels. While achieving carbon neutrality before 2050 is extremely challenging, Genesis will transform green bonds management. GFT is leading similar projects in the UK, Europe and in the Americas.

Project Genesis is a landmark collaborative project between the Hong Kong Centre of the Innovation Hub of the Bank for International Settlements (BIS) and the Hong Kong Monetary Authority (HKMA). The project is a prototype for green bond tokenisation built and implemented by GFT and Digital Asset.



A ground-breaking approach



Project Genesis is the first green finance project of the BIS Innovation Hub and combines blockchain, smart contracts, internet-of-things, cloud hosting and digital assets to deliver a digital infrastructure that manages the entire green bond lifecycle.

The platform tokenizes green bonds to enable investments in small denominations for retail investors, combined with real-time tracking of environmental impacts. It brings efficiency to the distribution of green bonds as well as insightful reporting on the environmental benefit of the green bond funds.

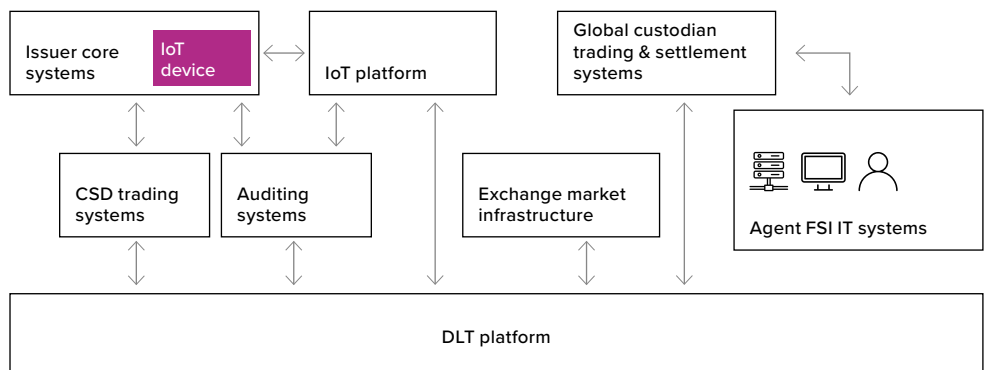
In practice, a green bonds ecosystem comprises several parties as shown in the following diagram: the issuer, the exchange,

market infrastructure, a global custodian, payments systems, and the green data provider.

A great volume of information is exchanged between parties during the bond lifecycle, so this process is inherently error prone. The Genesis DLT platform streamlines and simplifies this arrangement and provides a ‘golden source of truth’ that simultaneously serves all parties.

Open technologies ease the onboarding process using eKYC (electronic know your client) and investors can access a wealth of green data. Retail investors can interact directly to buy and sell green bonds on the secondary market.

Infographic: Green bonds – high level architecture



Benefits all round



The Digital Asset and GFT team deployed the platform on two enterprise blockchain platforms: Hyperledger Fabric and Hyperledger Besu. Leveraging Digital Asset's interoperability protocol, the Daml prototype has achieved real-time, automated synchronization of shared business processes across these ledgers, using smart contracts, while preserving the level of privacy demanded by regulated bodies.

By using Daml smart contracts, blockchain, and IoT, the platform combines real-time data visibility, automated workflows, and creates a single source of immutable truth across the entire green bond lifecycle. By using cloud infrastructure the platform can be used at scale in an automated and secure way, ensuring privacy protection while enabling seamless multi-party communication.

By streamlining information flows, Project Genesis offers benefits at every stage of bond lifecycle management:

PREPARATION AND ORIGINATION.

Genesis reduces elapsed time from 4-8 weeks to 2-4 weeks. Digital Asset's Daml generates standardised terms sheets and tokenised assets to compress the entire process. All parties have total visibility of what's happening in real-time.

SUBSCRIPTION. Bond issuance involves a flow of information from placing institutions through the central body to retail investors, creating many points of potential failure. Around 0.5% of orders are ingested with errors, which can take up to 125 days to rectify and cleanse. The introduction of Daml permanently eliminates this problem.

STRUCTURE, ISSUANCE AND

DISTRIBUTION. Bond issuance is a highly complex and time-consuming process, comprising several phases: preparation, subscription, settlement and investor access on both primary and secondary markets. DLT streamlines and standardises all aspects of the bond issuance process.

SETTLEMENT (CLOSING AND

PAYMENT). Under existing bond issuance arrangements, settlement is not feasible in real-time. Payment can be made on multiple payments rails, including faster payment or stablecoin, paving the way for digital currency payments.



04. A vibrant ecosystem of partners

The global financial system is opening up and collaboration is the norm. Project Genesis shows the power of partnership and collaborative technologies working in a real-time ecosystem. GFT and Digital Asset collaborated to design, build and implement the core platform. The internet of things (IoT) collects data from multiple sources within the bond issuance architecture, offering a comprehensive, integrated real-time picture, showing the green credentials of an asset or a group of assets.

Genesis offers an end-to-end communications platform for green bonds issuance and management. New partners can be added quickly and cost effectively through the Daml Ledger API. Current ecosystem partners include:

ALLINFRA CLIMATE, a blockchain-backed IoT platform that collects information across a portfolio of assets allowing firms to build a repository of data with a high degree of provenance which meets the most stringent of data governance standards.

OCTOPUS, one of the most successful electronic payment systems in the world, is used by around 98% of Hong Kong residents. Investors and other stakeholders will be able to track their green bond balance and contribution via the Octopus app.

JUMIO. Genesis includes real-time know your customer verification through Jumio and provides simulated integration using iAM Smart10 for authentication. This eases retail investor onboarding while increasing transparency and ensuring compliance.



A lighthouse project



Project Genesis provides a great example of how modern technology can be deployed to support a 'green' objective and benefit all parties involved in the bond issuance process.

There are limitless applications for the underpinning methods and technology, which can be integrated into the digital applications of individual banks or be provided as a 'white labelled' service. The application in Hong Kong is leading the world in retail green bond investment and demonstrates what is possible for

other jurisdictions around the world. Digital Asset's Canton can tokenise the bond while preserving the privacy and security that is needed. This guarantees that data will only be shared on a need-to-know basis to the parties involved in the transaction, meeting compliance requirements. The strategic adoption of DLT provides a blueprint for others to follow and the initiative has the potential to make a real contribution to a greener future, with green bonds now becoming more affordable and flexible.

GFT and the future of green bonds



With its understanding of financial markets and deep technical expertise, GFT and Digital Asset were ideally placed to lead Project Genesis and harmonise the interaction between all parties. GFT partnered with Digital Asset to design an end-to-end solution for the green bond lifecycle, using Daml smart contracts to define the workflow between all network participants, harnessing the power of the cloud for infrastructure services.

Interest in ESG and ethical investments has never been higher, and the solution created by GFT fulfils the needs of retail

investors wishing to participate in green bonds, now providing the reassurance of the immutable green provenance of the bond. Consumers and all participants in Hong Kong Project Genesis have set the benchmark for other markets worldwide, as the global investment community heads towards a greener and more sustainable future.

The success of Project Genesis and its rapid expansion acts as a beacon which can be repeated and replicated worldwide as a key driver of global green transformation.



World-class technology partners at work

GFT ■

About GFT – Shaping the future of digital business



As a pioneer for digital transformation GFT develops sustainable solutions across new technologies – from cloud engineering and artificial intelligence to blockchain/DLT.

With its deep technological expertise, strong partnerships and comprehensive market know-how GFT offers advice to the financial and insurance sectors, as well as in the manufacturing industry. Through the intelligent use of IT solutions GFT increases productivity and creates added value for clients. Companies gain easy and safe access to scalable IT-applications and innovative business models.

Founded in 1987 and located in more than 15 markets to ensure proximity to clients, the GFT team consists of over 9,000 determined talents. GFT provides them with career opportunities in all areas of software engineering and innovation. The GFT Technologies SE share is listed in the SDAX index of the German Stock Exchange (ticker: GFT-XE).

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Digital Asset

About 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 optimises workflows using smart contracts. Leading organisations across financial services, insurance and healthcare partner with Digital Asset to create new multi-party solutions that transform disparate silos into synchronised networks.

To learn more about the company's vision to build the Global Economic Network visit
> <https://www.digitalasset.com/global-economic-network>

To learn more about Digital Asset, please visit
> www.digitalasset.com

To find out more about GFT's support for innovative green solutions, visit > gft.com/greenbonds

Our experts



David Creer



Global DLT and Crypto Lead,
GFT



David has over eight years' experience working in innovation teams and six years working on DLT and blockchain related projects. He is an innovation specialist with a wealth of information in all emerging technologies (Cloud, AI, DLT, Data Analytics, etc) and expertly knows how these can be applied to a number of industry specific verticals. As a DLT expert, David is a leader in this field, and as well as being heavily involved in the technical implementation of projects, also participates in thought leadership activities and public speaking at major events.

Daniela Kielmann



Group Communications
Manager & CSR Manager, GFT



Daniela has over 14 years of corporate communications experience in the aviation, energy and technology sectors. Over the last six years she has become an expert in CSR and ESG reporting.

With a detailed understanding of EU sustainable finance regulations, ESG frameworks and ratings, Daniela combines sustainability expertise with a passion for organisational improvement. She has achieved an enviable reputation for constantly challenging the organisation with getting sustainability information out of systems originally not designed for delivering environmental or social figures.

Karen Qian



Associate Director of Sales,
APAC, Digital Asset



Karen Qian is an Associate Director at Digital Asset, where she helps financial institutions across Asia digitise, streamline and automate their processes using distributed ledger technology and smart contract solutions. Recently, Karen worked with the Hong Kong government on Project Genesis, which uses Daml, Digital Asset's core technology, to issue tokenized green bonds with verifiable green traceability.

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