

Yonsei University-FRTC of Japan FSA

"Green Digital Finance: Tokenization of Green Bonds and Carbon Credits"

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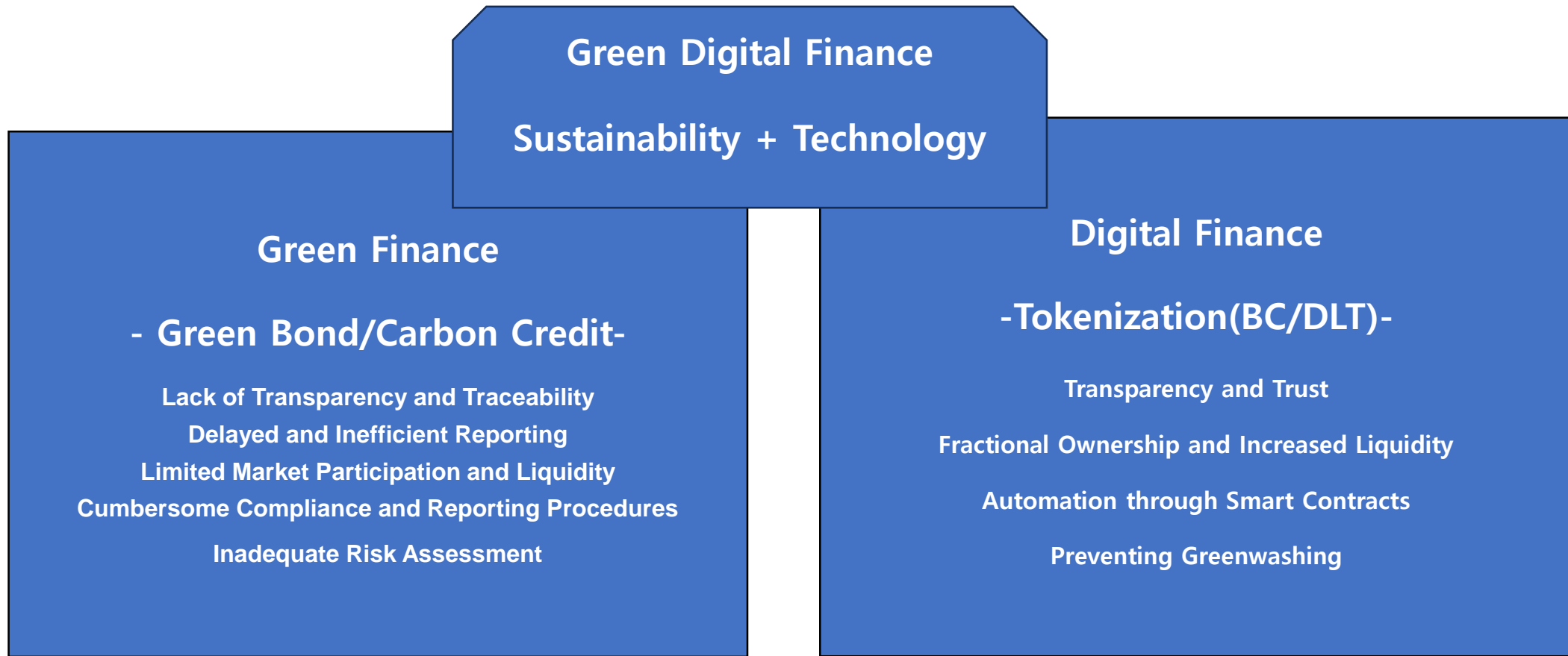
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1 Introduction

Transforming Capital Markets: The Rise of Green and Digital Finance



Green Digital Finance

- Fintech has had a significant impact on financial development and has the potential to advance the sustainable finance agenda (Chishti & Barberis, 2016; Jeucken, 2010).
- The G20 Sustainable Finance Study Group (SFSG) has highlighted emerging practices that apply digital technologies to sustainable finance (G20 SFSG, 2018). The Sustainable Digital Finance Alliance (SDFA) has identified challenges in connecting the financial sector to the real economy.
- Digital finance has the potential to enhance information disclosure and efficiency in the financial sector through improved systems and data. Additionally, it can promote inclusion and innovation in the real economy by expanding sustainable options and providing new sources of finance.
- Digital finance has the potential to overcome barriers that limit the scalability of sustainable finance, such as information asymmetries between investors and other stakeholders, and lack of capacity in communities.

Tokenization

- Tokenization is the process of converting the rights to an asset into a digital token on a blockchain. This concept is often used in the context of sustainable finance, such as carbon credits or green bonds, but can apply to any asset, digital or physical. The basic concept involves several key steps:
- **Asset selection:** Identifying the asset to be tokenized, which can be a physical object, a financial asset, a piece of intellectual property, etc.
- **Rights assignment:** Defining and assigning the rights associated with the asset, such as ownership, use, or revenue, that the token will represent.
- **Digital token creation:** Creating a digital token on a blockchain that represents the defined rights of the underlying asset. This token can be bought, sold, and traded.
- **Blockchain as a ledger:** The blockchain serves as a decentralized ledger that records all transactions related to the token, ensuring security, transparency, and immutability.
- **Smart contracts:** Use smart contracts, which are self-executing contracts with the terms of the agreement written directly into the code, to automate transactions and enforce the terms associated with the tokenized asset.

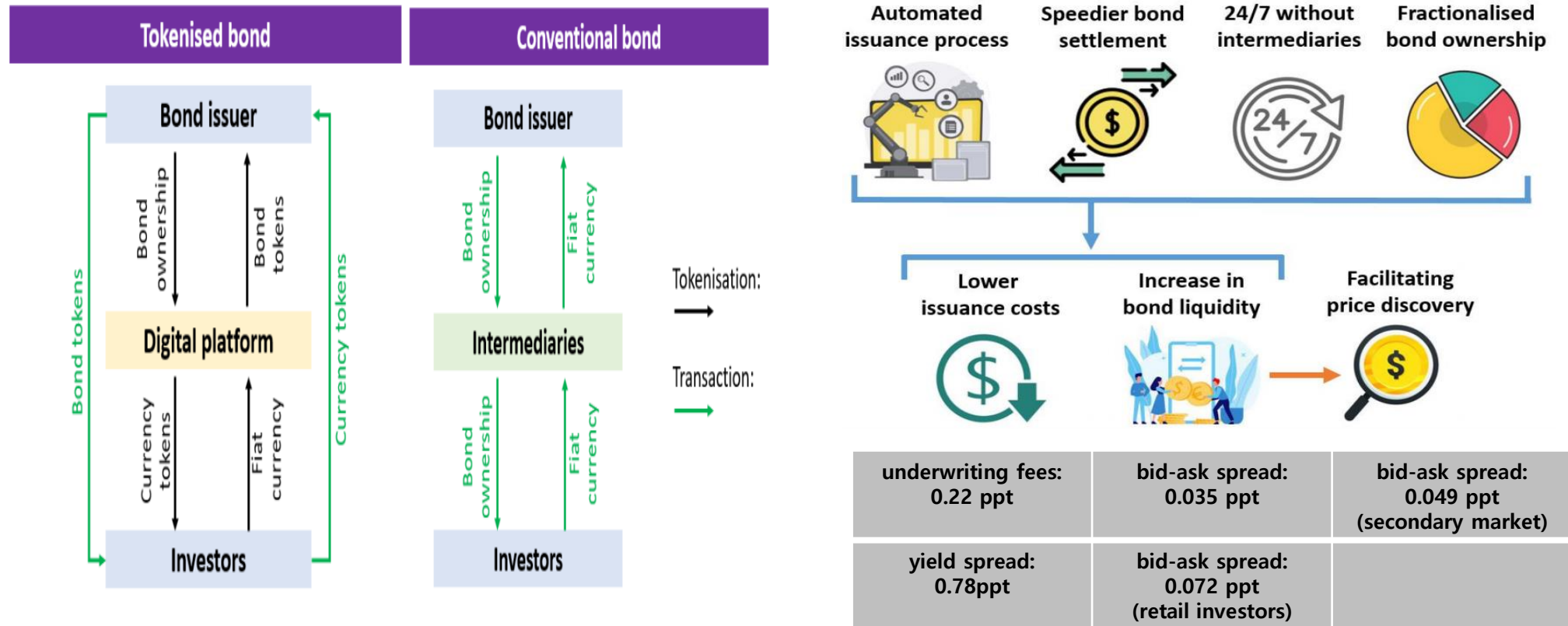


2 Tokenization: Green Bonds

Why Tokenize Bonds?

Paper-Based Bonds	→ Dematerialized Bonds	→ Tokenized Bonds
Paper bonds are physical certificates representing the bond's value.	Dematerialized bonds replace physical certificates with electronic records.	Tokenized bonds are digital representations of bonds on a blockchain
They incur high transaction costs due to the need for physical handling, storage, and security.	This reduces costs associated with physical handling and storage.	They significantly reduce transaction costs by eliminating many intermediaries involved in the bond issuance and management process.
The process of transfer, verification, and record-keeping is manual and time-consuming.	However, they still rely on traditional financial systems and intermediaries for transactions, record-keeping, and verification, which can be costly and less efficient.	The blockchain technology enables automated, secure, and transparent transactions, record-keeping, and verification, making the process more efficient and cost-effective.

Benefits of Tokenized Bonds: Efficiency and Liquidity



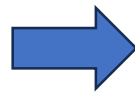
HKMA(2023), AN ASSESSMENT ON THE BENEFITS OF BOND TOKENISATION

Challenges for Green Bond Market

	<i>Challenge #1</i>	<i>Challenge #2</i>	<i>Challenge #3</i>
<i>Issuer</i>	Costly process	Lack of internal capacity to manage the green bond process	Complex regulation and rules to follow
<i>Investor</i>	Lack of supply in terms of projects	Fear of greenwashing / reputation	Costly process
<i>Intermediary</i>	Fear of greenwashing / reputation	Lack of supply in terms of projects	Lack of standardization

Why Tokenize Green Bonds?

- In traditional bond markets, it is challenging for stakeholders to monitor the flow of funds, provide real-time information on developments, or demonstrate the impact of green bonds (Banga, 2019).
- The Green Digital Finance Alliance and HSBC (2019) propose three ways to integrate blockchain technology with green bond markets.
 - 1) Building a blockchain-enabled bond issuance platform that can digitize the bond issuance process, including leveraging stablecoins for automatic settlement and payment to investors and setting up transparent nodes for oversight.
 - 2) Transforming manual reporting into data tokens so that investors can communicate in real-time and build asset history on a ledger for project aggregation
 - 3) To expand the bond market, small organizations such as communities can issue green bonds at a low cost on the blockchain system and offer them to the community through security tokens.



Enhanced Transparency: Tokenized bonds offer greater transparency as all transactions and data can be tracked and verified on the blockchain. This level of transparency makes it more challenging to engage in greenwashing since the environmental impact is more openly accessible and verifiable.

Improved Data Collection and Verification: Information on the environmental impact can be recorded on the blockchain, providing real-time, tamper-proof data. This can help investors make more informed decisions and reduce information asymmetry between issuers and investors.

Increased Accessibility and Liquidity: Tokenization can also increase accessibility and liquidity in the green bonds market. Increased participation and more fluid trading increase the chance of market scrutiny, which further discourages greenwashing practices and ensures that only authentic green projects receive funding.



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Tokenization: Carbon Credits

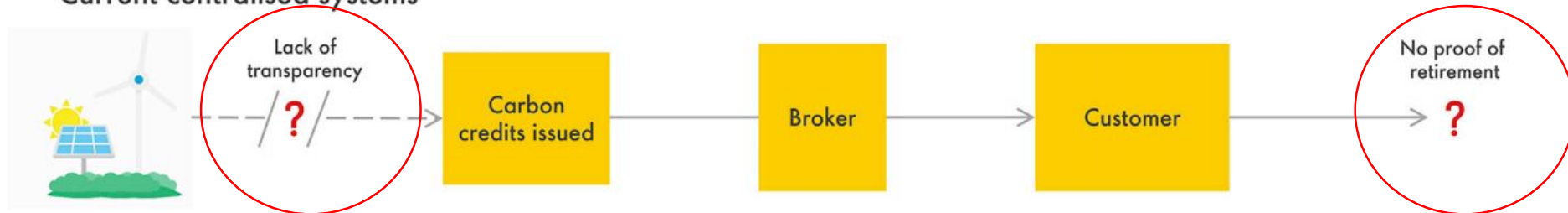
Traditional vs Tokenized Carbon Credits

Traditional Carbon Credits	Tokenized Carbon Credits:
Traditional carbon credits are physical or digital certificates that represent the right to emit a certain amount of carbon dioxide or other greenhouse gases.	Tokenized carbon credits involve the conversion of these credits into digital tokens using blockchain technology.
The transaction costs involve regulatory compliance, verification, transfer, and tracking of credits. These processes can be complex and time-consuming, often requiring intermediaries.	The blockchain's inherent properties significantly reduce the transaction costs associated with verification, transfer, and tracking. It offers a more efficient and transparent process. Smart contracts automate many processes , further reducing the administrative and compliance costs.
The market for traditional carbon credits can be less transparent , leading to higher search and information costs .	Tokenization on blockchain ensures immutability and transparency , lowering costs related to fraud or double counting.

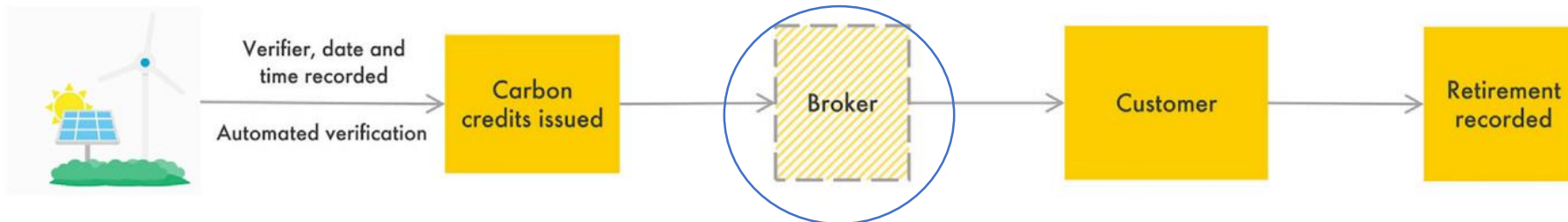
Why Tokenize Carbon Credits?



Current centralised systems



Blockchain enabled systems



Tokenizing Carbon Credits-Process

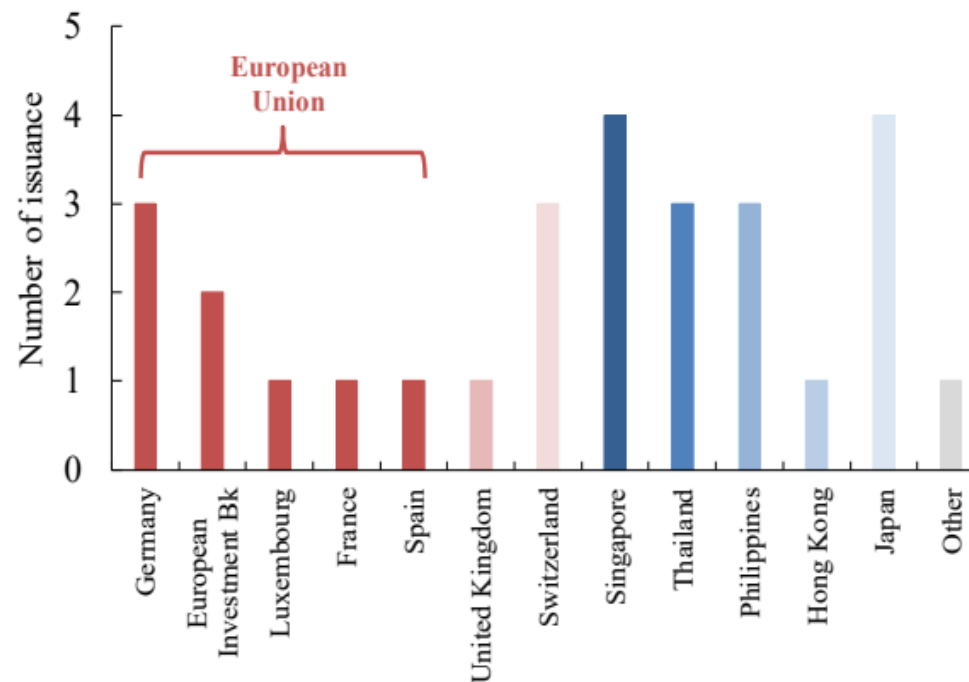
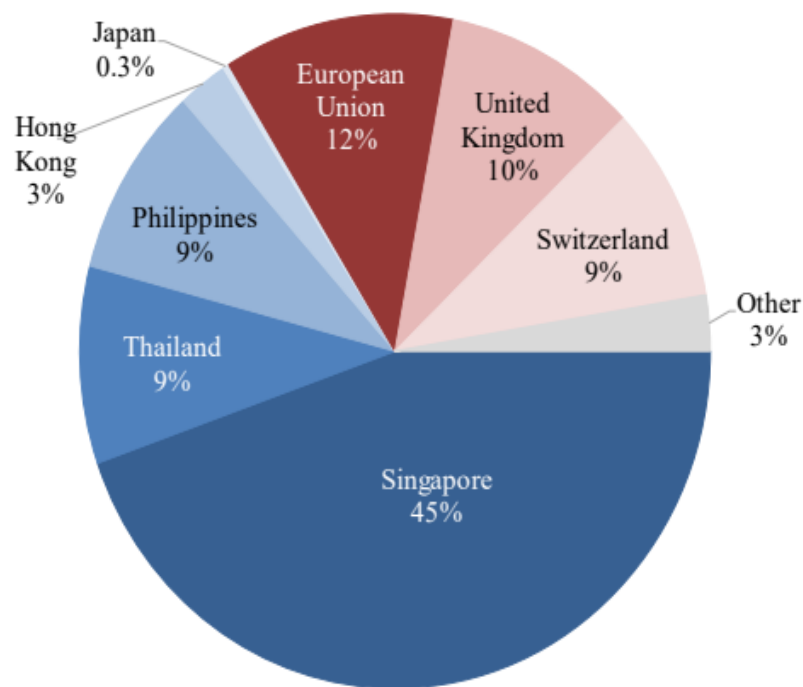
- **Carbon credit creation:** Carbon credits are created through various environmental projects that reduce, eliminate, or avoid greenhouse gas emissions. Each credit represents a certain amount of greenhouse gas reduction, typically one metric ton of CO₂ equivalent.
- **Certification and verification:** These credits are then verified by a third party to ensure that the emission reductions claimed are real, measurable and permanent. The credits are certified against a set of standards or methodologies that are accepted within the industry.
- **Digital representation:** After verification, carbon credits are tokenized. This means that each credit is represented as a digital token on a blockchain. These tokens act as digital certificates of ownership for the carbon credits.
- **Blockchain Recording:** The tokenized credits are recorded on the blockchain, which serves as an immutable ledger. This process ensures transparency and traceability, as all transactions involving the tokenized credits can be tracked and verified by anyone with access to the blockchain.
- **Trading:** Once tokenized, these carbon credits can be traded on digital platforms more efficiently. The use of smart contracts can automate the buying, selling or retiring of carbon credits. This increases liquidity and accessibility in the carbon market, potentially lowering transaction costs and barriers to entry.
- **Retirement of Credits:** When a carbon credit token is used to offset emissions, it is "retired" to prevent double counting. This retirement is recorded on the blockchain, providing a transparent and tamper-proof record that the credit has been used.



4 Prospects and Future Challenges

Digital Bond Issuance Led by Asian Countries

- In terms of issuance amount by geographical distribution, the majority (around 70%) was issued by Asian institutions, European issuers accounted for most of the remainder. In terms of the number of no jurisdiction had a significant numerical advantage, with the number of deals ranging from ranged from 1 to 4 across all jurisdictions.

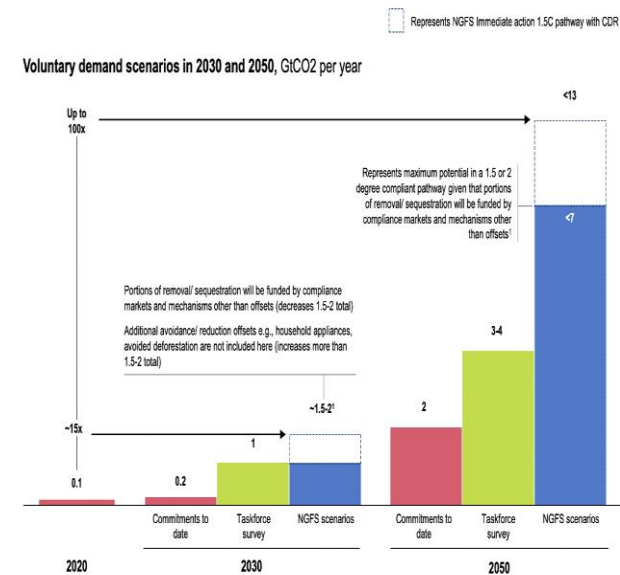


Rapid Growth of VCM

- Renewed recognition of the importance of carbon trading - the buying and selling of CO2 reductions - to the goal of limiting the global average temperature increase to 1.5 degrees celsius above pre-industrial levels.
- - The voluntary carbon credit has been underutilized due to its lack of enforceability, but it has been argued that to meet the 1.5°C goal, the amount of CO2 handled by voluntary carbon markets will need to increase 15-fold by 2030 compared to 2019.
- - voluntary carbon markets are rapidly expanding in size, from about 230 MtCO2 in 2020 to about 350 MtCO2 in 2021.

To meaningfully support a 1.5C pathway, voluntary carbon markets need to grow by >15x by 2030

Taskforce survey projects 1 Gt in 2030 and 3-4 Gt in 2050



1. We note that compliance markets will likely grow over time as regulatory requirements (national and sectoral) increase

Source: McKinsey, Network for Greening the Financial System (NGFS)

Commitments to date:

Demand that has been established by climate commitments of more than 700 large companies. This is a lower bound as it does not account for likely growth in commitments

Taskforce survey:

Projected offset demand envisioned by subject matter experts within the Taskforce on Scaling Voluntary Carbon Markets (i.e., sits between upper and lower bound)

NGFS scenarios:

Removal/sequestration required in 1.5-degree and 2-degree NGFS climate scenarios in 2030 and 2050.

This is an upper bound in 2050 as it assumes that all removal/sequestration is supported by voluntary offsets whereas in reality it will be made up by a mix of voluntary and compliance markets as well as mechanisms other than offsets

Note:

This analysis (i) does not take into account the split of credits that will be traded in compliance vs. voluntary markets; (ii) is built on a starting assumption that the world is compliant with a 1.5 or 2 degree pathway

Source) <https://carboncredits.com/>

Transforming Carbon Markets:

The Rise of Blockchain Technology and Tokenization

- Tokenization is becoming critical to improving carbon markets by leveraging blockchain for transparency and efficiency. This shift aims to revolutionize carbon trading and the achievement of environmental goals.
- **Verra, along with Gold Standard (GS)**, engaged in extensive consultations on utilizing blockchain technology to enhance their registry systems. This could ensure better tracking and verification of carbon credits, enhancing market integrity.
- The **International Emissions Trading Association** released guidelines on blockchain use in carbon markets with the aim to provide a framework for incorporating blockchain technology into carbon trading, ensuring that tokenization processes are aligned with market needs and sustainability goals.
- The **World Economic Forum** established the **Crypto Sustainability Coalition**.
- Both the **Taskforce on Scaling Voluntary Carbon Markets** and the **Voluntary Carbon Markets Integrity Initiative** are working on standardizing contractual requirements.

Advancing Cross-Border Carbon Trading in Asia

- **Harmonization and Policy coordination:** For example, to link the Korean and Japanese carbon markets, harmonization of carbon credit standards, monitoring, reporting, and verification processes is needed. Government and intergovernmental efforts are needed to develop policies that support cross-border carbon trading.
- **Linking platforms:** The development of a common digital platform where carbon credits can be traded across borders would facilitate connectivity. Blockchain technology could play a key role in ensuring the transparency and security of this platform.
- **Pilot projects:** Starting with pilot projects involving entities from both countries could help understand the challenges and opportunities of such a linkage.
- **Support for voluntary carbon markets:** Even in the absence of a formal cross-border trading mechanism, blockchain can support voluntary carbon markets, where companies and individuals participate in carbon offsetting initiatives across borders.
- **Outreach to other Asian countries:** Extending this system to other Asian countries would require a commitment to encourage them to develop or link their ETS to this interlinked system.

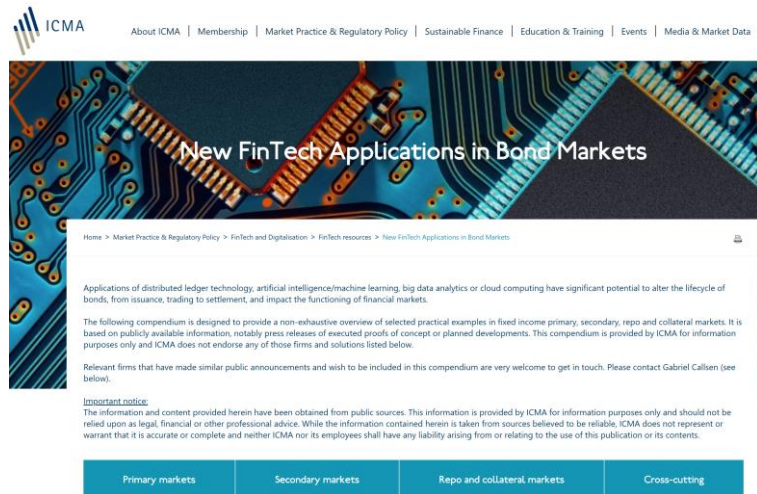
Digital Bond Market Forum (DBMF)- Tridecagon Project

- The Digital Bond Market Forum (DBMF) was established in line with ABMI's Medium Term Roadmap (2023-2026), which emphasizes the importance of digital transformation as a key strategy to integrate and standardize ASEAN+3 bond markets. The forum aims to improve market efficiency and integration through advanced digital technologies, including distributed ledger technology (DLT), artificial intelligence, and big data analytics.
- The DBMF and Tridecagon project, as part of the exploration of distributed ledger technology (DLT) and blockchain in the ASEAN+3 region, can make a significant contribution to the realization of digital bonds and tokenized carbon credits in Asia.
- The DBMF can promote harmonized regulations and practices across the ASEAN+3 countries by focusing on the digitalization and standardization of the bond market. This approach would facilitate cross-border transactions and attract more international investors, thereby broadening the market base.
- By leveraging the infrastructure and lessons learned from the Tridecagon project, Asian capital markets can adopt these technologies to create digital bonds and tokenize carbon credits.

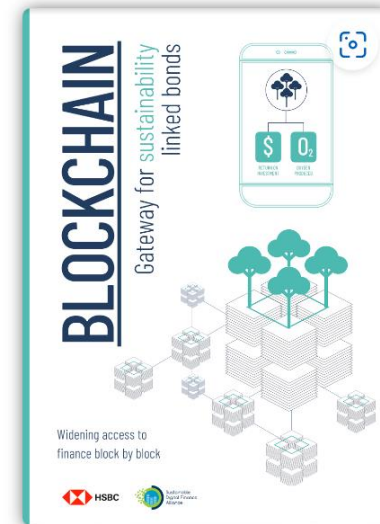


Appendix

New FinTech Applications



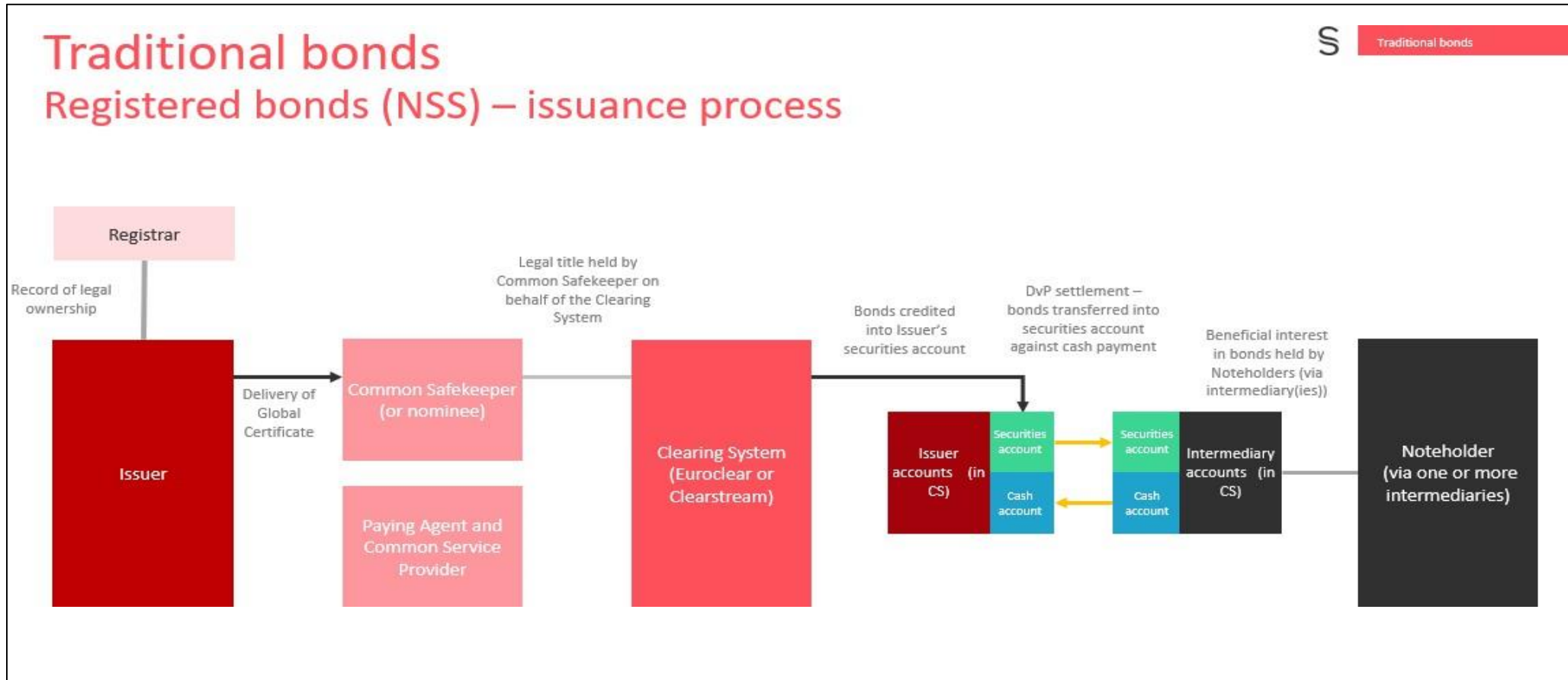
Digital Technologies for Mobilizing Sustainable Finance: Applications of Digital Technologies to Sustainable Finance



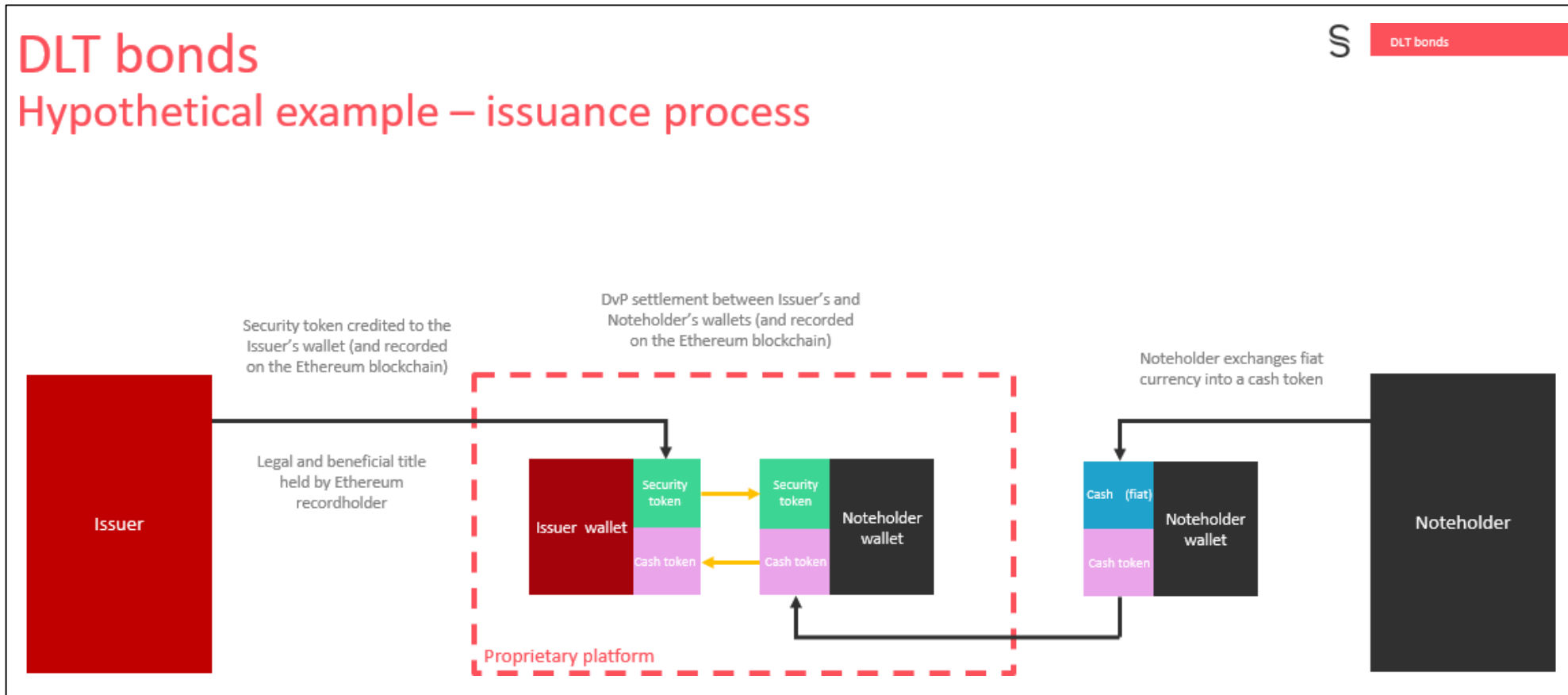
Blockchain Gateway for Sustainability Linked Bonds

- <https://www.icmagroup.org/market-practice-and-regulatory-policy/fintech-and-digitalisation/fintech-resources/new-fintech-applications-in-bond-markets/>
- <https://www.greendigitalfinancealliance.org/initiatives>

Traditional vs. Digital Bonds (1)

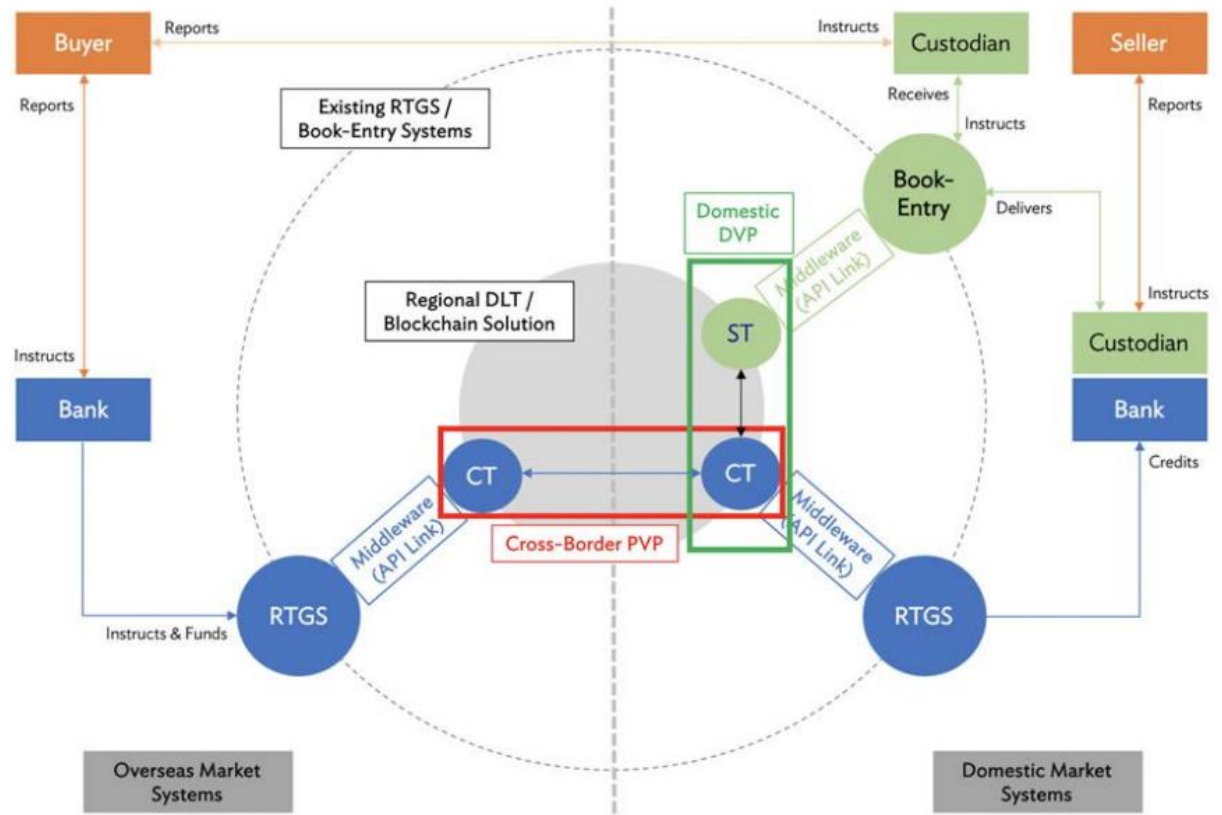


Traditional vs. Digital Bonds (2)



Project TRIDECAGON: Connecting ASEAN+3 Markets

- The "Connecting Market Infrastructures in ASEAN+3: The Project Tridecagon Proof of Concept" paper, published in June 2023 by the Asian Development Bank, details the execution and results of Project Tridecagon.
- This project explored the application of Distributed Ledger Technology (DLT) and blockchain (BC) for the settlement of cross-border securities transactions within the ASEAN+3 region.



Thank You!