

ICMA DLT Bonds Reference Guide

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The full list of members of ICMA's DLT Bonds Working Group can be found on [ICMA's website](#).

Editor & Author:

Gabriel Callsen, ICMA

gabriel.callsen@icmagroup.org

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Background

In line with ICMA's mission to promote well-functioning, resilient cross-border capital markets, a strategic objective is to foster the development of DLT-based bond markets and avoid fragmentation. To this end, ICMA's DLT Bonds Working Group brings together stakeholders across the value chain of the international debt capital markets, including public sector and private sector issuers, investors, banks, law firms, market infrastructures, central banks, credit rating agencies, data providers and technology vendors. The Working Group's objectives are to (i) raise awareness and educate market stakeholders, (ii) provide guidance and (iii) foster collaboration and engage with regulatory authorities.

The DLT Bonds Reference Guide complements the following resources, which are freely available on ICMA's website:

- [ICMA FAQs on DLT and Blockchain in Bond Markets](#)
- A legal analysis of bond documentation: [Considerations for risk factors and disclosure in DLT bond offering documents](#)
- Technical standard: [ICMA's Bond Data Taxonomy \(BDT\)](#) – a common language in machine-readable format (XML) to promote automation and interoperability between systems both for traditional debt securities and DLT-based bonds.
- Legal model agreement: [Global Master Repurchase Agreement \(GMRA\) Digital Assets Annex](#)
- [Market intelligence](#): ICMA's tracker of new transactions and announcements involving DLT-based bonds, amongst others.

Introduction

Distributed ledger technology (DLT) and blockchain¹ continue to gain traction for debt securities issuance and securities financing. Prominent DLT-based bond transactions in 2024 include a \$750m equivalent multi-currency landmark issuance by Hong Kong SAR², a 200m CHF-denominated bond with a seven-year maturity by the World Bank, Siemens' repeat issuance of a DLT-based security (€300m) under German Law, as well as a \$300m digital issuance by the Asian Infrastructure Investment Bank (AIIB) under English law, amongst others.³

This evolution was accompanied by the launch of a wholesale CBDC (CHF) in Switzerland in December 2023, and the Eurosystem's "exploratory work" to facilitate settlement of DLT transactions in central bank money in 2024. Between May and November 2024, more than 200 transactions involving 64 institutions have been settled in central bank money, totalling €1.59bn.⁴ In addition, various forms of tokenised cash were used for securities financing transactions.⁵

To foster wider adoption of tokenised assets, in November 2024 the Monetary Authority of Singapore (MAS) published the Guardian Fixed Income Framework (GFIF), in collaboration with ICMA and other industry stakeholders, and the Guardian Funds Framework (GFF). The Guardian Fixed Income Framework embeds ICMA's Bond Data Taxonomy and integrates token frameworks as well as design considerations, amongst other aspects, seeking to facilitate the implementation of tokenisation in bond markets.⁶

However, the size of the market for DLT-based debt securities remains relatively small compared to global bond markets. Key challenges include legal and regulatory fragmentation, interoperability between legacy systems and DLT-based solutions, broader adoption of common standards and lack of wholesale CBDCs or alternative forms of digital cash across key markets, as well as a lack of wider investor participation.

1 See ICMA FAQs on DLT and blockchain in bond markets regarding definitions and further background.

2 The digital green bonds issued by the Hong Kong SAR Government on 7 February 2024 marked the first adoption of ICMA's Bond Data Taxonomy (BDT) by a sovereign, supranational and agency (SSA) issuer. This was also a first for a green bond. See also [press release](#).

3 See [ICMA's tracker of new FinTech applications](#) for further information.

4 ECB [press release](#): Eurosystem completes tests using DLT for central bank money settlement, 4 December 2024

5 See [ICMA's tracker of new FinTech applications](#) for further information.

6 MAS Announces Plans to Support Commercialisation of Asset Tokenisation, [published](#) on 4 November 2024.

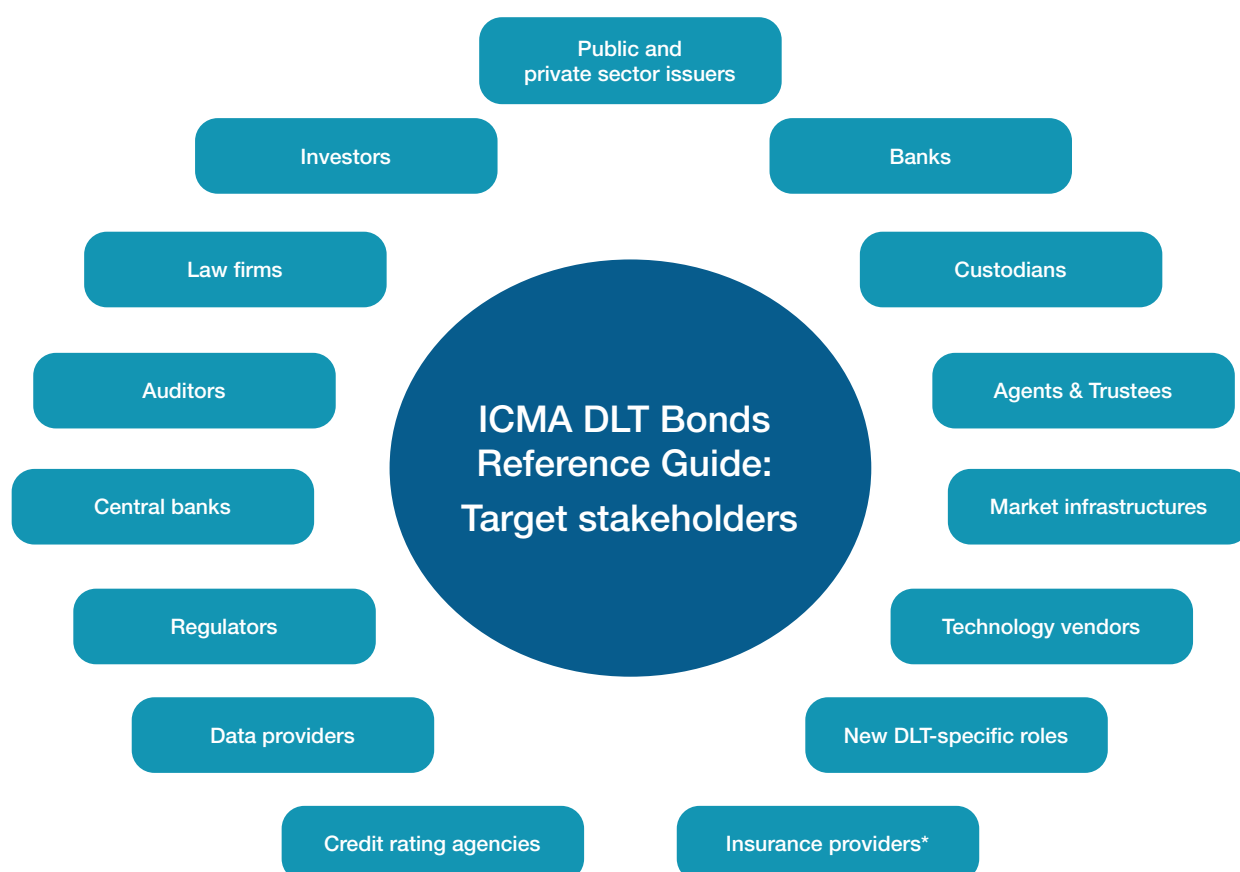
A collaborative effort across the global value chain

To raise further awareness and share learning experiences from transactions involving DLT across jurisdictions globally, ICMA's DLT Bonds Working Group has produced a Reference Guide that highlights considerations for the end-to-end lifecycle of DLT-based debt securities.

This initiative is a collaborative effort between investors, SSA issuers and private sector issuers, custodians, banks, market infrastructures and law firms who have been involved in the issuance, trading and provision of related services for DLT-based debt securities. The Reference Guide was initially driven by ICMA's asset and investment management constituents, drawing on practical experiences and requirements for investment processes and regulatory compliance for tokenised securities, with a particular focus on DLT-based bonds.

How to use the ICMA DLT Bonds Reference Guide

The Reference Guide is designed for market practitioners, including both traditional DCM and digital asset functions, as well as a broader audience of market stakeholders. It comprises over 50 practical questions and serves as a reference point across the lifecycle of a DLT-based debt security.



* For DLT-specific technology risks

The Reference Guide is split into different sections, which cover the following aspects:

- A) Pre-issuance considerations, addressing the nature of the debt security as well as the nature of the DLT network/platform;
- B) Marketing, disclosure and issuance;
- C) Registration and safekeeping;
- D) Trading and settlement;
- E) Investor considerations;
- F) Asset servicing and lifecycle events;
- G) Third-party engagement;

Answering these questions and making the right choices will depend on various factors, such as the governing law of the instrument, the location of investors, listing requirements, the features of the DLT network, and settlement and distribution arrangements, among others. Each stakeholder, whether directly or indirectly involved in a DLT-based bond transaction, must carefully assess these aspects in consultation with legal counsel.

While the Reference Guide primarily covers DLT-based debt securities, a number of technology-related aspects, notably those related to networks and smart contracts, may also be applicable to other financial instruments. The Reference Guide is a living document and, by definition, non-exhaustive. In light of the rapid evolution of technology, it will be reviewed and updated as and when necessary.

A) Pre-issuance considerations

(i) Nature of the debt security

1. What is the role of DLT in the issuance?

Examples include:

- Primary issuance and secondary trading settlement
- Record and transfer of ownership
- Lifecycle management such as coupon payments
- Reporting and sustainability-related disclosure
- Reducing settlement risks and improving settlement times
- Achieving cost savings

See also Q&A 5 “What are DLT bonds” and related Q&As in [ICMA's FAQs on DLT and blockchain in bond markets](#).

2. What is the legal nature of the security?

- a) Does the security comprise a dematerialised bundle of contractual rights?
- b) Does the security comprise a distinct “token asset” from a legal perspective?
- c) Does the security provide rights or interests in respect of a distinct security?

3. Which law will govern the security, and which law will govern proprietary matters in relation to the security?

- a) Does the governing law of the debt security allow use of DLT for the type of security being issued i.e. bearer, registered or other form of issuance?
- b) Does the law impose any DLT-specific formalities, limitations or restrictions that need to be taken into account?
- c) Does the law of the jurisdiction of the issuer (or the constitution of the issuer) have an impact on the format of the security to be issued?
- d) Is the governing law of the platform different to the governing law of the security and do the terms of each clearly identify which laws govern which aspects?
- e) Will the governing law be specified as part of the digital asset or DLT system, and if applicable, in line with the UNIDROIT Principles on Digital Assets and Private International Law (such as Principle 5)?
- f) Are there any conflicts of law considerations relating to (without limitation) (i) governing law of the security, (ii) location of issuer and/ or (iii) platform operator location?

4. From a regulatory or private law perspective, is the DLT-based debt security treated in the same way as traditional securities?

Examples include:

- How is the security classified for regulatory purposes?
- How will the security be treated for the purposes of prudential regulation?
- What are the legal mechanisms for transfer of the security or taking security over the securities or for establishing other proprietary interests?
- How will the security be treated for the purposes of insolvency law?

(ii) Nature of the DLT network/platform

5. What DLT and/or blockchain network(s), or digital assets platform will be used?

- a) What entity is operating the DLT, or digital assets platform, if applicable?
 - What is the regulatory status of the operator?
 - Is a specific identifier such as a Legal entity identifier (LEI), Market identifier code (MIC) or Digital token identifier (DTI) required?
 - Is there a legal requirement or regime applicable to the way in which the platform operator performs its role?
 - Who is responsible (legally vs technically) for the infrastructure?
 - What on-chain rights does the platform operator have? See also section 8.
 - What powers does the platform operator have in relation to the ledger, for example to amend or override records?
 - Does the platform use a UTXO⁷-based or account-based system, and are there any overlaying interfaces?
 - What measures are in place to restrict on-chain possession of the security?
 - Are there external node operators?
 - What are the off-chain contractual relationships?
 - How does the digital assets platform perform identity management?
 - If performed on chain, does the identity management contract follow a standard? If so, which one?
- b) What DLT(s) or blockchain network(s) will be used for token implementation?
 - Is a specific identifier such as a DTI or a Functionally Fungible Group (FFG) DTI code required?
 - Is the chain that the digital assets platform exists on Ethereum Virtual Machine (EVM) compatible?
- c) What are the accessibility features of the DLT or blockchain network?
 - Private or public? If private, is there an intention or a path to make the DLT or blockchain network public?
 - Permissioned or permissionless? At network or sub-network level?
 - Centralised or decentralised, and to which degree?
 - If public or decentralised, does the arrangement involve any permissioned / centrally administered sub-networks?
 - Are Layer 2 and sidechain technologies used?
 - Multichain networks: When issuance takes place in multichain networks, should multi-chain functionality of the tokens be enabled or prevented?
- d) Are there new DLT-specific roles?
 - E.g. crypto securities registrar, central account keeper or tokenisation manager, prescribed by law or regulation?
 - E.g. contractually defined roles?
 - E.g. validation roles?
- e) What is the regulatory status of the DLT-specific entities (if applicable), and are they subject to oversight? If so, by whom?
- f) What are the supported messaging standards and protocols? E.g. Swift, ISO, FIX, FpML, DLT-based communication protocols?

⁷ Unspent Transaction Output (UTXO) refers to the amount of a digital currency left over following execution of a transaction on a DLT network, see further information [here](#).

6. What are the platform access arrangements?

- a) If relevant, does the platform have an access agreement and/or rulebook to govern a participant's access and use of the platform?
- b) What restrictions, if any, apply in relation to sub-participation arrangements?
- c) Have on-boarding arrangements been considered as conditions precedent to gaining access to the platform? E.g. legal, technical and operational requirements?

7. Smart contracts and tokens:

- a) For what purpose(s) are smart contracts used? E.g. transfer of DLT-based debt instruments, record ownership, process lifecycle events such as coupon payments?
- b) Who is allowed to interact with the smart contract (roles and rights concept)?
- c) What smart contract standards, if any, does the tokenisation platform utilise? E.g. ERC-20, ERC-1400 or ERC-3643?
- d) If the smart contract is proprietary, how are risks related to backdoors, overflows, gas problems etc. mitigated?
- e) Does the smart contract code merely give effect to the legal contract, or does it form part of the legal contract?
- f) Are the smart contracts compliant with relevant local laws and regulations?
- g) Is it possible to correct errors or undo erroneous entries? What is the process for unwinding erroneous transactions?
- h) Can participants choose to deploy their own smart contracts on the DLT or blockchain network?
- i) Is compliance with the terms of the smart contracts enforced on or off chain?
 - If compliance is enforced on chain, is the compliance contract upgradable and modular?
 - Does the compliance contract follow a standard, and if so, which one?
- j) Is the smart contract source code public?
- k) Is the smart contract source code open source?
- l) Have the smart contracts been audited? If so, by whom and when? Is an audit report publicly available?

8. Are there specific due diligence requirements with regard to DLT-related services providers?

- a) How many nodes does the network have?
- b) How many different, independent entities operate these nodes?
- c) How are these nodes distributed geographically?
- d) Is hosting a node a requirement? If a participant can run a node, what are the requirements?
- e) Are the nodes in data centres or self-hosted?
- f) Who are the hosting providers?
- g) Who are the node operators? In the case of public DLT or blockchain networks, can these be identified?
- h) Do nodes have different powers (e.g. around issuance, validation of transactions, access etc)?
- i) Can a single participant decide to shut down, or adversely influence, the DLT or blockchain network's performance?
- j) Is the digital assets platform or DLT/blockchain network chain susceptible to a 51% attack?
- k) What measures are in place to restrict on-chain possession of the asset?
- l) Is the DLT or blockchain network fork-resistant?
- m) What is the network's uptime (past compared to present)? Is it continuously monitored, and if so, by whom?
- n) What is the TPS (Transactions Per Second) of the DLT or blockchain network?

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- o) Which hash algorithms are used by the network? Are these approved by a standard-setting organisation such as ISO or others?
 - p) Is transfer of the DLT-based debt security to another DLT or blockchain network possible?
 - q) Will the technical infrastructure be supported for the full life of the DLT-based debt instrument?

9. Fall-back considerations in the event of a failure of the DLT system during the life of the DLT-based bond:

- a) Are business continuity plans in place, for example, to address the risks of being tied to particular arrangements that may become out-of-date or fail to continue in operation at the levels or for so long as expected at the outset?
- b) Have any mechanics been considered that would allow the DLT bond to switch to a traditional issuance structure (such as a global note in the ICSDs or other structures)?
- c) In case of early termination, do contractual arrangements for use of FMIs address such risks?
- d) Is there an applicable note programme that would allow the creation of replacement notes at short notice if DLT-based bonds needed to be cancelled?
- e) What are the succession/transitional arrangements for critical service providers, if any?
- f) Are succession/transitional arrangements required by law? If yes, by which law?

B) Marketing, disclosure and issuance

10. Who are the target investors eligible to buy and hold the DLT-based debt instrument?

- a) Professional⁸
- b) Retail

11. Are there any DLT-specific selling restrictions that need to be considered including in relation to local law financial promotion and marketing rules?

12. Is the DLT-based debt instrument issued, or intended to be issued, as a public offering or a private placement?

- a) Who is the counterpart for the investor – e.g. a bank syndicate or the issuer?
- b) If applicable, how will investors be whitelisted?
- c) Are there additional KYC requirements for investors, for example in relation to the issuer or a DLT platform operator?

13. Can a DLT-based debt security be issued under an existing MTN programme i.e. does the underlying base prospectus include the mechanics needed to issue DLT bonds? If not:

- a) Is a stand-alone prospectus required?, or
- b) Is the DLT-based debt security distributed as a wholesale offer? (e.g. targeted at Qualified institutional buyers (QIB) (144A), qualified/professional investors under MiFID II / UK MiFIR)), or
- c) Is it Prospectus 'free' (and not otherwise listed on a regulated market or offered to the public in the EU / UK)?

⁸ Depending on the jurisdiction, different terms may be used such as accredited or qualified investors.

14. Are there DLT-specific risk factors and disclosure requirements? Note: risk factors are highly structure dependent and need to be considered on a case-by-case basis.

For reference, see:

- a) ICMA's [considerations for risk factors and disclosure in DLT bond documentation](#) (22 November 2023)
- b) [HKMA risk management considerations related to the use of DLT](#) (16 April 2024)
- c) Clearstream/DTCC/Euroclear [Digital Asset Securities Control Principles \(DASCP\)](#) (29 May 2024)

15. How are add-on financial crime/sanctions issues addressed? Including:

- a) Monitoring procedures
- b) Updating of policies, and
- c) Reporting

16. Tax-related questions:

- a) Will stamp duty (or equivalent) arise on any issue or transfer of the DLT bonds?
- b) Do US tax-related (e.g. TEFRA) questions arise? And if so, how can they be addressed?
- c) Which entity is responsible for tax withholding?
- d) Do any additional withholding considerations apply?

17. Is the DLT-based security eligible for the purposes of applicable contractual frameworks such as:

- a) Repo and securities lending documentation, for example, as defined under the Global Master Repurchase Agreement (GMRA) Digital Assets Annex, or the Global Master Securities Lending Agreement (GMSLA) Digital Assets Annex, or derivatives documentation, and
- b) Regulatory frameworks, for example, does it qualify as eligible collateral under applicable prudential rules or mandatory margining rules?

18. Will the DLT-based debt instrument be issued within a so-called “regulatory sandbox” or central bank pilot programme i.e. a temporary regime that allows for exemptions from, or modifications of, laws and regulations?

- a) If so, which regulations/legislation have been disapplied for the purposes of the issuance?
- b) Are any DLT-specific regulatory notifications needed? If so, who is handling this?
- c) What conditions and limitations apply to the issuance under the relevant regulatory sandbox?

19. Is the DLT-based debt instrument’s digital representation e.g. in software, databases or interfaces based on a market standard? E.g. [ICMA's Bond Data Taxonomy](#)?

20. In the case of Green, Social or Sustainability bonds, will allocation and impact data be recorded on the DLT or blockchain network?

21. In the case of Sustainability-linked bonds, is DLT or blockchain used to improve transparency and tracking of related Key Performance Indicators (KPIs) and Sustainability Performance Target (SPTs)?

C) Registration and safekeeping

22. **Subject to the issuance model and characterisation of the DLT or digital assets platform, what role(s) will be performed on the DLT or digital assets platform with respect to registration and safekeeping?**
23. **Is a depository or other FMI required to hold the notes/be a top-tier custodian under the law of the issuance?**
24. **Is the DLT-based debt instrument admitted to the operations of a central securities depository?**
 - a) Are there any DLT-specific considerations that are relevant in this context?
 - b) Is the CSD operating a DLT infrastructure? And if so, has the set-up under the CSD's license (such as CSDR in the EU) been validated by the relevant regulator?
25. **If not, what entity will have custody of / register / hold the notes?**
 - E.g. under Luxembourg law, who is the Central Account Keeper (that keeps a securities issuance account and top-tier securities accounts) and the Account Keeper (custodian)?
 - E.g. under German law, who is the crypto securities registrar?
 - Does any intermediate operator, including a CSD and other entities, have any form of proprietary interest in the securities?
26. **How is the list of holders updated, and by whom? See also section A (ii).**
27. **How is the list of holders accessed, and by whom?**
28. **What account arrangements will be in place to reflect definitive entitlements?**
 - a) Are records on-chain and/or off-chain?
 - b) Are there any back-up off-chain records, and which record is definitive for legal purposes?
 - c) What is the definitive record for the "issue outstanding amount"?
29. **Do the terms of the securities or governing law of the securities recognise as holders of the securities persons who hold the securities through a chain of intermediaries and whose details may not therefore appear on the DLT or blockchain network?**
30. **How does the on-chain custody model link to traditional off-chain custody infrastructure? E.g. existing settlement systems and downstream custodial relationships?**
31. **Can the DLT-based debt security be held under existing custody arrangements with custodians / sub-custodians?**
 - a) Are amendments to the existing custody arrangements required to address incremental risks, such as the risks of "forks" or "airdrops"?
 - b) Are fundamental amendments required, and if so, what information should be included?
 - c) Is there a regulatory framework that applies specifically to DLT-based securities (as opposed to traditional securities)?
32. **What is the contractual arrangement between the issuer, the entity holding the notes, the entity operating the DLT / digital assets platform, and other entities such as paying agents, if they are appointed?**
 - In particular, at what stage is the issuer's payment obligation discharged and may it be discharged before the holder of the securities receives payment and, if so, whose additional credit risk do holders assume?

D) Trading and settlement

33. Liquidity:

- a) Have banks involved in the transaction agreed to provide liquidity for the DLT-based debt security to investors?
- b) Can the DLT-based debt security be traded OTC only (voice or electronic)?

34. Listing and trading:

- a) Is the DLT-based instrument listed on a regulated DLT exchange, multilateral trading facility (MTF), or other regulated trading venue, or unlisted? If listed, is the DLT-based instrument also admitted to trading?
- b) On which electronic trading venues is the DLT-based debt security tradable, and if so, how many banks provide liquidity?
- c) In the case of a regulated DLT exchange or MTF, do the terms and conditions reflect the specific nature of DLT-based instruments including any IT-related considerations?

35. What is the settlement model for issuance and transfers of DLT-based debt instruments (i.e. Delivery versus Payment (DvP) or Free of Payment (FOP))?

- a) Does the transaction benefit from settlement finality within the meaning of the Principles for Financial Market Infrastructures (PFMI)?
- b) How is settlement finality achieved on (i) issuance of the debt instrument and (ii) transfers of the debt instrument?
- c) Is there a distinction between DvP versus FOP transactions (if relevant)?

36. In a DvP context, how is the cash leg of the DLT-based debt instrument settled?

- a) What form of cash is, or will be, used?
 - i. Fiat currency
 - ii. Wholesale CBDC (e.g. including atomic settlement, no counterparty risk, overnight interest)
 - iii. Tokenised bank deposits
 - iv. E-money token or asset-referenced tokens (ART) (based on the EU's Markets in Crypto-Assets Regulation (MiCAR) or other local laws)
 - v. Other
- b) How is DvP ensured?
 - i. Through a central party (e.g. CSD, CCP) or via a technical protocol (e.g. Hashed Timelock Contract (HTLC))?
 - ii. If a technical protocol is used, will it be settled atomically or based on a HTLC smart contract?
- c) What parties are eligible to take part as direct participants in the DvP arrangements?

37. What are the interoperability arrangements?

- a) If DLT-based assets and cash are on different chains to ensure DvP?
- b) Between a DLT-based asset and traditional settlement systems?
- c) Between a traditional debt security and its 'digital twin' i.e. a DLT-based equivalent instrument (if applicable)?
- d) To enable transfer of the DLT-based debt security between different funds with different custodian banks and domiciles?

38. Are participants required to pre-fund transactions and, if so, how far in advance?

39. What is the target settlement cycle? E.g. T+0, T+1, T+2, T+3, T+5, other?

E) Investor considerations

40. **Does the DLT-based debt security meet fund eligibility rules (such as UCITS, AIFMD)?**
 - a) What are the requirements for a DLT-based debt security to be eligible?
 - b) What category of assets does the DLT-based debt security fall into, e.g. liquid or illiquid 'bucket'?
41. **Is the DLT-based debt security aligned with the overall investment strategy of the investment or asset management firm?**
42. **Is the number of market-makers sufficient to satisfy applicable best execution requirements?**
43. **Is there an expected yield enhancement?**
44. **Are the terms and conditions and term sheet of the DLT-based debt security released early enough in advance allowing for sufficient time to conduct due diligence processes and legal checks?**
45. **Ratings:**
 - a) Is the DLT-based debt security's rating identical to the issuer's rating?
 - b) Is an expected rating released ahead of the issuance?
46. **Is DLT used to facilitate fractionalisation of a bond to offer trading in smaller denominations, subject to compliance with the applicable regulatory framework?**
47. **Valuation: How and when (e.g. intraday, end of day) is the valuation for the DLT-based instrument computed?**
 - a) What is the reference instrument for the DLT-based debt security?
 - b) Is there a comparable traditional debt instrument of the same issuer?
 - c) Is the valuation based on a model?
 - d) Can end-of-day prices of the DTL-based debt instrument be sourced from relevant data providers (such as prices displayed by OTC market-makers)?
48. **What are the key management arrangements for a DLT-based debt security?**
 - a) Can the DLT-based debt security be distributed to an end investor's non-intermediated wallet?
 - b) Who keeps the public and private keys? Are there specific legal or regulatory requirements for the safekeeping of the keys?
 - c) Is the offering semi, self or non-custodial?
 - d) If custodial:
 - What steps and technologies are used to ensure security of a user's keys?
 - Does the key manager keep a backup?
 - Is there a process to migrate control of the keys? If so, what is the process?
 - Are keys or any shares of a key retained/stored with a third party that is not running the tokenisation platform?
 - Are keys encrypted when signing?
 - e) If tokens are used and private keys are lost, can assets be recovered?

49. **Risk management: what incremental risks (if any) apply due to the distributed nature of the arrangement, for example, in relation to liquidity risks, market risks and operational risks? Note: these need to be considered on a case-by-case basis.**

a) Is there a business continuity plan in place?

b) Are there specific cybersecurity risks?

See also due diligence considerations in section A) (ii).

50. **What stakeholders may need to be consulted as part of the due diligence and/or investment process for a DLT-based debt security?**

a) Internal: E.g. Legal & compliance, Internal audit, Risk controlling, Portfolio and trading, Operations, Accounting & tax, Financial reporting, Technology

b) External: E.g. Fund regulators, Fund trust trustees, Custodians

F) Asset servicing and lifecycle events

51. **Are interest payments of the DLT-based debt security managed through a DLT platform or through traditional methods?**

52. **Are other lifecycle events managed through a DLT platform or through traditional methods? E.g. redemption, early redemption, partial redemption, buy-back, cancellation?**

53. **Are asset servicing and lifecycle events executed in a fully automated or in a partially automated manner?**

G) Third-party engagement

54. **Have relevant third parties been engaged in connection with (without limitation):**

a) Creation of the platform vis-à-vis notary function and settlement (e.g. incumbent settlement systems and operators),

b) Custody of DLT-based debt instruments (e.g. global custodians with off-chain incumbent relationships),

c) Custodial bridges with other settlement systems (e.g. Clearstream, CMU, DTCC, Euroclear, SDX) and,

d) Admission or listing authorities

ICMA Zurich**T: +41 44 363 4222**

Dreikönigstrasse 8
8002 Zurich

ICMA London**T: +44 20 7213 0310**

110 Cannon Street
London EC4N 6EU

ICMA Paris**T: +33 1 8375 6613**

25 rue du Quatre Septembre
75002 Paris

ICMA Brussels**T: +32 2 801 13 88**

Avenue des Arts 56
1000 Brussels

ICMA Hong Kong**T: +852 2531 6592**

Unit 3603, Tower 2, Lippon Centre
89 Queensway, Admiralty, Hong Kong

