

Study Panel on the Use of Digital Bonds in ESG Investing —Research Report—

April 27, 2023

JPX Market Innovation & Research, Inc.
Nomura Securities Co., Ltd

- **The aims of the study panel**

As security tokens backed by assets such as bonds and real estate become more prevalent, Japan Exchange Group (“JPX”) issued its first Digitally Tracked Green Bonds (“GDTB”), a digital corporate bond (a type of security token) stored on a blockchain, in June 2022. GDTB is the first digital green bond issued in Japan, and JPX and JPX Market Innovation & Research (“JPXI”) hope that by enhancing the scheme’s usability, it will attract a wider base of issuers and investors.

To support this effort, JPXI partnered with a number of bond market stakeholders to form the Study Panel on the Use of Digital Bonds in ESG Investing. The panel brought together issuers and investors with green bond experience, as well as securities firms, banks and trust banks, ESG rating agencies, system vendors, and public sector organizations, etc. to promote better understanding of the mechanism of GDTB and its various challenges, and to engage in dialogue about its potential to drive the growth of green investing.

- **Organizational framework of the study panel**

Organizer: JPX Market Innovation & Research, Inc.

Administration: Nomura Securities Co., Ltd.

- **Member companies:** listed below

This report was prepared by JPXI and Nomura based on the discussions that took place at study panel meetings, and does not necessarily reflect the participants’ opinions or positions.

■ Study panel meetings and topics

Date		Topics
First	September 28, 2022	<ul style="list-style-type: none"> · Expectations of foreign investors regarding impact reporting · Initiatives in digital green bonds · Examples of digital green bonds overseas
Second	October 20, 2022	<ul style="list-style-type: none"> · Potential advantages of wholesale digital bonds · Functions available on the Green Tracking Hub, the sustainable finance platform initiative · Current status of and future functionalities to be added to JPX's ESG Bond Information Platform · Market perceptions of GDTB
Third	November 17, 2022	<ul style="list-style-type: none"> · Follow-up on Q&A from the second meeting · Legal and tax implications of wholesale digital bonds · Boosty's role in GDTB and a description of its services
Fourth	December 15, 2022	<ul style="list-style-type: none"> · Investors' perspectives on GDTB · Custodians' perspectives on digital bond settlements · Securities firms' perspectives on digital bond settlements
Fifth	January 19, 2023	<ul style="list-style-type: none"> · Survey findings <ol style="list-style-type: none"> a. Frequency of reporting b. Data entry by issuers c. Greenium, or green premium d. Ideas for utilizing project data
Sixth	February 16, 2023	<ul style="list-style-type: none"> · The qualities and functions desired in the secondary market for digital bonds <ol style="list-style-type: none"> a. The challenges of the secondary bond market – insights from a working group of the Japan Securities Dealers Association b. Current needs of investors in the secondary bond markets and their expectations for digital bonds c. Green bonds in the secondary market · CONNEQTOR, the ETF trading platform introduced by the Tokyo Stock Exchange · How securities firms are dealing with digital bonds · Advantages of using digital currencies in digital bond settlements · Issuers' issuance costs
Seventh	March 16, 2023	<ul style="list-style-type: none"> · Review of the study panel's draft report · Latest developments in sustainability disclosures · Follow-up on past surveys conducted by the study panel

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1. Current status of ESG bonds and an outline of GDTB

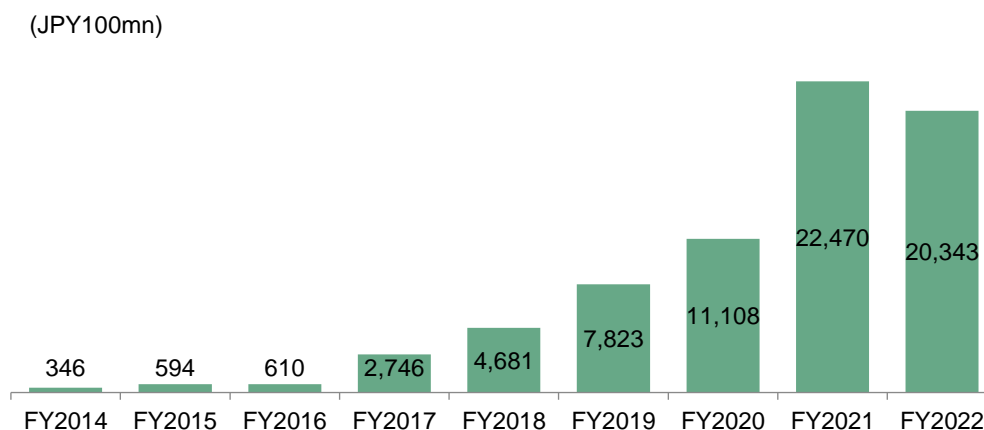
1) Growth of the ESG bond and green bond market

As environmental awareness continues to increase worldwide, the Japanese market has seen a surge in green bonds and other ESG-focused instruments. The market for these financial products, which stood at just ¥200bn-plus in 2017, was valued at over ¥2trn in 2021 – a tenfold increase – with more growth expected in the coming years (see Figure 1).

Amid these trends, investors are pursuing responsible investing initiatives with ever-increasing vigor. Responsible investors support bond issuers in two ways – through financing and engagement. In addition to having ESG instruments in their asset portfolios (financing), they engage in dialogue with issuers to steward their ESG endeavors over the medium to long term (engagement).

And within this context of responsible investment, the domestic bond market is seeing a growing number of players joining net-zero initiatives such as the Net Zero Asset Owner Alliance (NZAOA), incentivizing them to be mindful of the greenhouse gas (GHG) emissions related to their portfolios. As such, the task of monitoring investments has become more important than ever before.

Figure 1: Monetary value of domestically issued green bonds by fiscal year (as of March 31, 2023)



Sources: Capital Eye, Bloomberg

2) Creation of a market framework for security tokens

With the introduction of “Electronically Recorded Transferable Rights to Be Indicated on Securities, etc.” as a legally defined financial instrument in May 2020, a framework was created for the issuance and trading of security tokens in accordance with the Financial Instruments and Exchange Act. A series of demonstration tests ensued, in which

financial institutions and other organizations trialed the token, followed by public issue to general investors. Digital bonds in particular were made available to retail investors following early initiatives to trial the digital asset; they now constitute a significant sector within the market for security tokens. Tokens backed by a single or a small number of real estate properties are also widely marketed to retail investors.

Seeing these shifts in the business landscape, JPX and Nomura noted the absence of wholesale bonds in the digital and ESG space. They conceived the idea of a financial instrument powered by blockchain and other digital technologies that is also sustainability-focused.

3) The challenges of green investing (for investors and issuers)

As ESG investing continues to grow at a rapid pace, a number of unique challenges have been identified for issuers and investors respectively, particularly in the field of green bonds.

For issuers, because environmental benefits comprise part of the fundraising pitch, they are obligated to report the details of the benefits realized. There are certain green metrics, such as CO₂ emission reductions, that they can employ to fulfill these requirements, but the task of collecting and compiling relevant data is demanding compared with conventional financial figures. Furthermore, if bonds are issued over multiple rounds, the associations between each bond and the underlying projects become complex, making these products costlier to manage than conventional bonds.

For investors, on the other hand, one of the difficulties is the limited opportunities to actively collect information on the projects they invest in. They may make green investments driven by a desire to contribute to the environmental benefits, but they have little choice but to wait for the issuer's report to come out to be updated on progress.

Also, investors do not only receive green reports from issuers; they also must prepare green reports for the owners of the funds they manage. The green data on their investment targets must often be compiled from multiple sources (such as integrated reports and annual reports from company websites), making such data very time consuming to collect. Additionally, the lack of uniform data disclosure standards hinders comparability. The need for rigorous, transparent methods to define green investments and measure performance has also been noted as a concern.

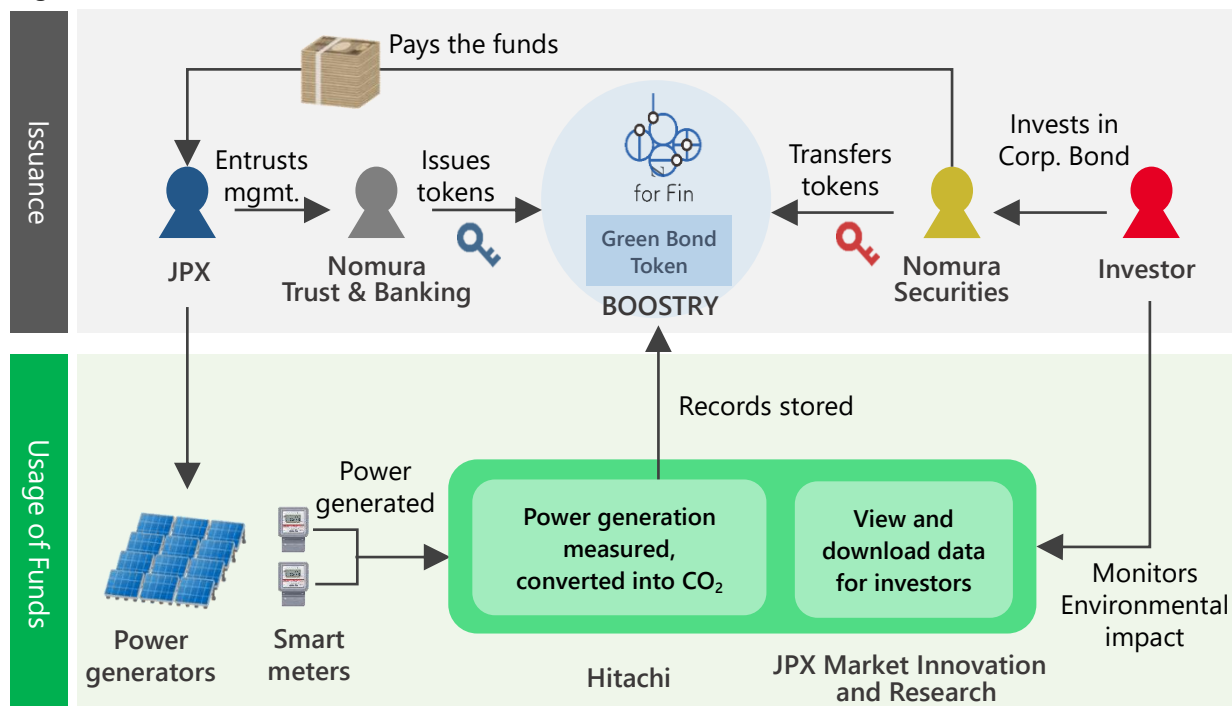
4) The challenges addressed by GDTB

To address these challenges, JPX initiated an experimental digital green bond issue in the form of a security token. Figure 2 outlines the details of JPX's GDTB issue of June 2022, while Figure 3 presents a schematic of how this token works. This was the first green digital wholesale bond issued in the Japanese market.

Figure 2: Outline of JPX's June 2022 issue of GDTB

Item	Details
Name of bond	Japan Exchange Group 1st Unsecured Bonds (with special pari passu clause among specified bonds and transfer restrictions) (Digitally Tracked Green Bond)
Target market	Wholesale
Term	1 year
Amount of each bond	¥100m
Issue amount	¥500m
Coupon	0.050%
Issue date	Friday, June 3, 2022
Bond rating	N/A
Underwriter	Nomura Securities Co., Ltd.
Fiscal agent/bond registry administrator	The Nomura Trust and Banking Co., Ltd.
Blockchain platform	Boostry's ibet for Fin
Use of proceeds	Capital investment for biomass/solar power generation facilities
Rating agency	Rating and Investment Information, Inc. (R&I)

Figure 3: Schematic of GDTB issue



The proceeds of the issue were allocated to green power plant projects. As mentioned above, collecting the relevant data (power output and CO₂ emission reductions) is a laborious task, and managing such an investment is often a complex undertaking. To free issuers from this labor, JPX worked with Hitachi to build a mechanism that automatically retrieves the plants' power output and equivalent avoided emissions from smart meters and similar devices to compile a database.

The GDTB also addresses the problems on the investor's side – the inability to access performance data, and the lack of a single source from which they can obtain their investment targets' green statistics. JPX developed a website that shows the data graphically and allows investors to view the information stored in Hitachi's system 24/7. With access to the latest data, investors no longer have to wait for a yearly report from the issuer. Investor feedback suggests that if more issuers take advantage of this scheme and consolidate their data into a single resource, the website could grow into an extremely useful tool.

The use of security tokens confers two major advantages to this scheme. Firstly, due to the nature of blockchain technology, data is difficult to falsify. When data is retrieved from power plants and shared with investors, the daily power output and CO₂ emission reduction figures are simultaneously written onto the security tokens. If a bad actor should access the website and rewrite the data there, it will be immediately detectable because the authentic data is entered into the security tokens on a daily basis. The

scheme is thus designed to ensure veracity.

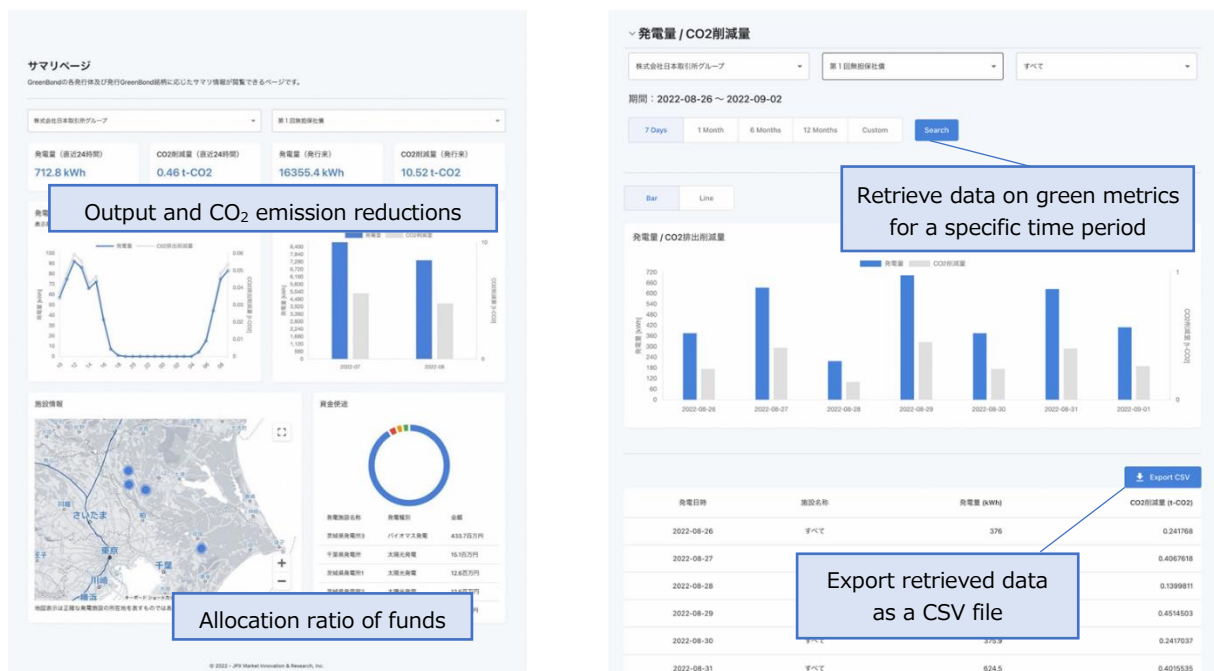
The second major advantage of the format is applicability across financial products. One possible future application is sustainability-linked bonds – an increasingly popular financial instrument with a built-in incentive linked to the green metrics set by the issuer (such as reduction of CO₂ emissions). The coupon is target-based, meaning that different rates apply according to how the issuer performs against those goals.

Because sustainability-linked bond issuers must identify the extent to which the targets were met and calculate how to reflect the results in interest payments, among other requirements, the operational burdens lead to higher costs. However, security tokens can link environmental metrics data to a smart contract, enabling performance assessments, interest calculations and payments to be performed automatically. Even complex financial instruments could be operated at low cost, which should prove a significant benefit.

Screenshots of the aforementioned website (the Green Tracking Hub) are provided in Figure 4. The left screenshot presents an overview of the projects (power-generating facilities in this JPX example), including their locations and graphical representations of their operational metrics. Power output is shown in near real-time, and investors can gain a visual sense of how their money is being put to work.

The right screenshot shows the web page from which users can download various data such as daily or monthly power output. Raw data may be exported as CSV files, which eliminates the need to collect disparate PDF files from multiple investment target companies and lowers the cost of preparing reports for investors. Access can be limited to participating investors or extended to the general public (the website in Figure 4 is publicly available).

Figure 4: Green Tracking Hub screenshots



5) Advantages of GDTB from the perspective of investors

While the size of the ESG bond market has grown every year, so too has the work associated with the compilation and reporting of their impacts. Investors are accessing the website of each firm in their portfolio to gather relevant data, and the burden of compiling all this information can be substantial. And because data is usually reported on an annual basis, the time lag between allocation of investment funds and the disclosure of its impacts may render the information old and outdated. Furthermore, ESG bonds are defined by how their proceeds can be spent, so they must be monitored to ensure that the money contributes to the activities and targets identified.

GDTB's reporting feature alleviates these pain points and enhances usability in multiple ways with its speed, search functions, and reliability. With a one-stop website that compiles data for each issuer or bond, data collection becomes easier. And not only can users view data in near real-time, they can also retrieve data for any time period they require.

Furthermore, because the website provides a clear a view of green metrics such as CO₂ emission reductions, performance and use of proceeds are clear. Transparency of data allows users to be confident about the integrity and green impact of their investments.

6) Advantages of GDTB from the perspective of rating agencies

During the growth phase of green bonds, the main function of outside rating agencies was to evaluate alignment with the Green Bond Principles. However, with investors growing more focused on impact in recent years, there will likely be growing demand for services to verify the accuracy of impact reports or measure investment impacts. There is also interest in more efficient data collection and access to a diverse set of evaluation metrics.

Issuers are faced with the need to report to their investors accurately and efficiently. A uniform standard for calculating green metrics would go a long way towards increasing efficiency, particularly as reports are audited and certified through an outside evaluation process to establish accuracy. A convergence of standards would therefore be in their interest.

Investors, on the other hand, desire a variety of data to measure their investment impacts, so are likely to support more diverse metrics. However, greater diversity of data will mean added costs for the issuer if accuracy is to be verified. It is a major obstacle that promoting the kind of impact reporting investors desire will incur significant costs in order to ensure its reliability.

However, GDTB allows issuers to take advantage of a platform powered by technologies such as IoT, smart contracts and blockchain to digitalize and automate many processes, reducing the number of items rating agencies must examine when auditing or certifying reports. This will reduce the overall evaluation cost and, as a result, could help standardize impact reporting while also making it possible to employ a more diverse set of evaluation metrics.

Internationally, the market is increasingly demanding that impacts be disclosed for each company or for each bond, and issuers are pressed to deliver. According to Sustainalytics, international investors see room for improvement in the types, granularity, and scope of data in current disclosures, among other issues. They would like to see 1) greater transparency and standardization for improved comparability, as well as 2) disclosures that would allow them to track the impact of their investments. Those in the industry need to proceed with an awareness of the demands in the global market and the ways in which they could be met.

2. Practicalities of digital bond settlement and associated challenges

1) How the blockchain platform works

The JPX bond issue made use of ibet for Fin, a decentralized blockchain platform supported by the fintech firm Boosty and operated (as of March 31, 2023) by a consortium of 15 securities firms, banks, and other organizations.

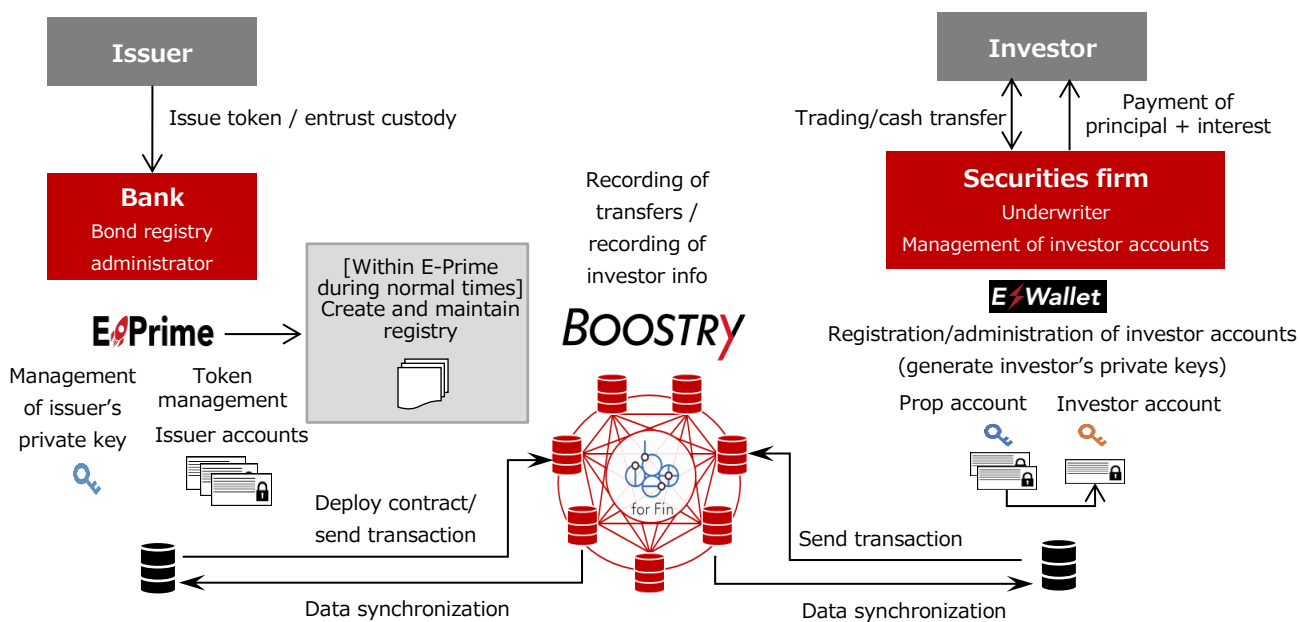
Figure 5 is a schematic showing how ibet for Fin works. Consortium members are granted direct access to the network, while issuers and investors access it indirectly via their bank or securities firm. Issuers and investors utilize the network as an easy-to-use service, and do not need to invest in creating the infrastructure. When a securities firm, bank, or other organization accesses the blockchain to update any data, this information is shared with consortium members who are relevant to the specific digital bond, and the change is entered into the bond registry.

Bond token issues are processed by the bank on behalf of the issuer. The bank also generates a bond registry onto which bondholder data will be recorded, and assumes the role of registry manager. Boosty's E-Prime service allows managers to 1) maintain the issuer's private key (an access key used by issuers to issue and transfer tokens within ibet for Fin), 2) function as a blockchain node (writing data onto or retrieving data from the network), and 3) generate a bond registry.

Securities firms act on behalf of investors and assume the task of managing their private keys and bond tokens. Boosty's E-Wallet service allows them to 1) maintain their own and their investors' private keys (an access key used by investors to maintain and transfer tokens within ibet for Fin), 2) function as a blockchain node (writing data onto or retrieving data from the network), and 3) manage their investors' accounts. Under the current mechanism, investors' digital bond holdings are actually maintained by their securities companies.

Although issuers can go through the bond registry manager to access investor details, investor information on the blockchain overall is not freely disclosed; consortium members who are not involved with the bond issue and third parties do not have access.

Figure 5: ibet for Fin mechanism



The data used to generate bond registries is stored on the ibet for Fin blockchain. E-Prime allows users to retrieve this data, and to create a registry by saving this information together with any other data required.

In the event of a blockchain outage, E-Prime allows users to see the last updated version of the bond registry. The service also puts redundancies in place and creates backups of databases in order to ensure continuity.

2) Practical operation of digital bond settlement and its associated challenges

Generally speaking, book-entry bonds managed by the Japan Securities Depository Center (JASDEC) are settled on a delivery versus payment (DVP) basis using current accounts at the Bank of Japan. On the other hand, digital bonds maintained on the ibet for Fin blockchain platform are settled on a free of payment (FOP) basis. While there are no designated settlement accounts for digital bonds, there is not much difference between these two bond types with regard to the administrative work involved in executing settlements, save for the fact that the cash movements and rights transfers of digital bonds are processed sequentially due to their non-DVP nature.

Figure 6 shows the processes that take place on blockchain platforms on the trade and settlement dates. On the trade date, the investor sends trading instructions to the custodian bank, while the securities firm provides the custodian bank with the details of the trade; the custodian bank will compare the two to make sure everything matches.

On the settlement date, the custodian bank makes a wire transfer via BOJ-NET to the securities firm's current deposit account and notifies the firm to that effect. The securities house will then execute a rights transfer on the blockchain platform and provide notification to the custodian bank. As reference, Figure 7 shows how the trade date and settlement date processes would work in JASDEC's DVP-settlement transaction.

Figure 6: Trade date and settlement date processing on a blockchain platform

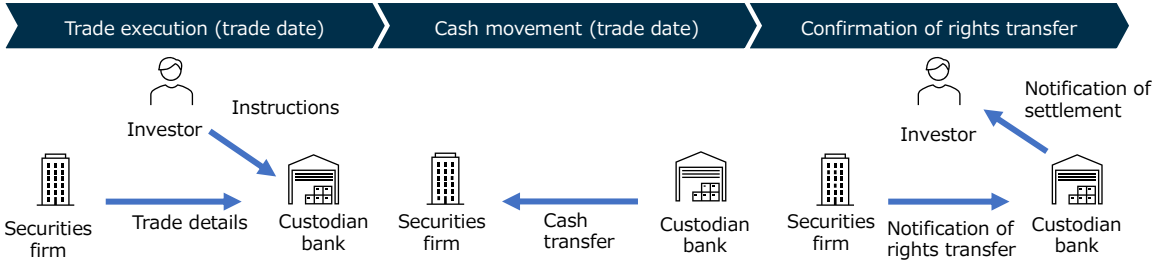
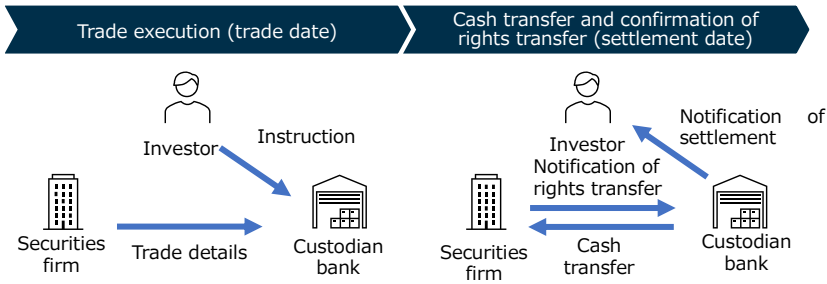


Figure 7: JASDEC's trade date and settlement date processes (DVP settlement)



Custodian banks charged with managing digital bond investment securities must contend with two issues: risk and operational efficiency. The risk arises from the custodian's inability to ascertain via the blockchain platform that the rights have been fully transferred; they can only learn this after receiving word from the securities firm. Furthermore, because digital bonds are settled on an FOP basis, settlement failure risk is more of a concern compared with bonds that are settled via DVP. Another aspect of FOP is that custodian banks must manually process certain aspects of the settlement, such as cash transfer and confirmation of rights transfer, making digital bonds more cumbersome to work with than book-entry bonds.

There are measures that can be taken to help resolve these issues, such as 1) allowing custodian banks to access the blockchain platform, 2) constructing a mechanism that connects the blockchain platform to BOJ-NET, Zengin System, and other fund transfer systems, and 3) building a system in which settlements are automatically executed upon the transfer of rights. It is hoped that these improvements will be made in future.

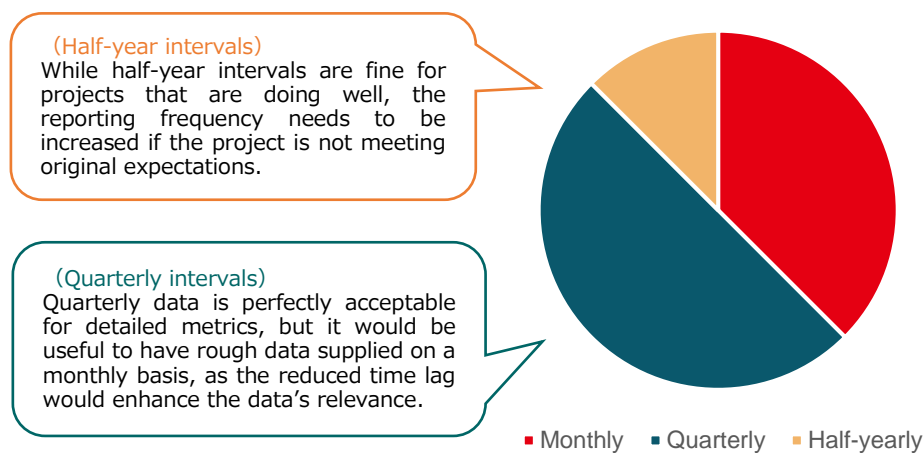
3. Disclosures that investors seek from bond issuers (feedback from study panel participants, obtained through survey)

The study panel conducted a survey to gauge opinion on green metrics and other disclosures that investors seek from issuers. The findings presented below indicate what investors feel they need, organized by category.

1) Reporting frequency

A majority of respondents would prefer the issuer's reports to be issued on a quarterly or monthly basis. One reason they cited was that, if the metrics can be measured automatically, they would like to be informed as soon as possible. Some respondents also pointed to the need to be informed quickly of any unexpected developments, while others wished to report non-financial data relevant to the period covered in their quarterly financial reports, which would not be possible if data were provided only annually.

Figure 8: Result of investor survey on reporting frequency



2) Data entered by bond issuers

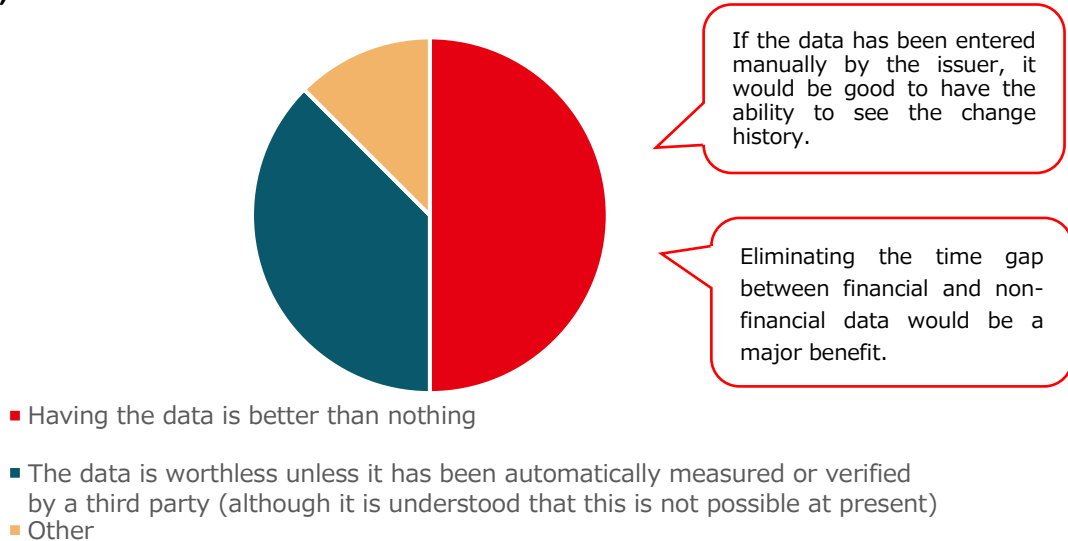
When asked about green metrics and performance metrics that cannot be measured automatically and are manually entered by the bond issuer, opinions were split on whether this kind of reporting would have any merits in terms of timeliness or transparency. About half of respondents said that such data would be better than nothing, while others contended that the data needs to be measured and recorded automatically or verified by a third party to be meaningful.

A portion of respondents indicated that if data provided by the issuer could bridge the timing gap, making the non-financial data contemporaneous with the financial figures in their quarterly reports, they would utilize the data even if were not auto-collected. This

need was particularly strong regarding projects relating to the social and governance elements of ESG, areas in which many of the metrics are not conducive to automatic measurement.

Figure 9: Result of investor survey on data entered by issuer

3) Centralized data retrieval



Some respondents also commented on the convenience that would be afforded by the ability to retrieve data on green metrics from a single source. The hope is that if the information is consolidated at one website, companies will adopt a uniform format for green data disclosure. Another idea mentioned by respondents is for data that is not automatically measured to be updated at the same frequency across all entities. In addition to synchronizing frequency, some respondents also indicated that they would like to see every issuer disclose and update their information at the same time (at the end of each month, for instance).

4) Use of funds and target attainment

Investors indicated that they would like to have the ability to monitor how their investment funds are being used and how the projects are performing against their chosen KPIs.

5) Green benefits measured against investment value

At the moment, green benefits are rated based on the company's investment ratio as a proportion of the total value of their bonds. However, some respondents questioned the validity of this formula, suggesting that they should be rated based on the investment ratio as a proportion of the total value of projects.

4. Potential evolution of GDTB

The survey asked respondents to name potential projects that could be tracked with GDTB and to provide ideas on how the data could be used. Respondents were asked to put technical feasibility aside at this point.

1) Ideas for projects/data use

Responses obtained from bond issuers are listed in Figure 10. The projects they named were specific and indicative of the industries they operate in. They included energy-saving building renovations, procurement costs of sustainable aviation fuel (SAF) and other types of green fuel, capital investments, and green equity. Many of the data use ideas were suggestions that could help reduce the reporting workloads of issuers, such as the sharing of data with ESG rating agencies, government and policymaking authorities, and investors. Some respondents indicated that they would like to use the data for peer comparisons, or share it internally within their organization.

Responses obtained from investors are listed in Figure 11. Some respondents pointed out that, besides green bonds, the GDTB framework could be used for a wide variety of other bonds, such as ESG bonds, sustainability-linked bonds, and transition bonds. Some specific tracking applications were brought up as project ideas, including the use of fixed-point cameras to measure facility usage and the monitoring of food waste. Others suggested using the technology to collect non-financial data that is infrequently disclosed and harder to come by, such as the percentage of managerial positions held by women or the progress of demonstration experiments. Ideas for utilizing data included calls for development of standard data items and standardized data sets, while others proposed ideas that would improve the timeliness of non-financial information, or help quantify investment impacts.

Figure 10: Issuer survey

















Project ideas	Data use ideas
 Energy-saving building renovations	 Provide data to ESG rating agencies
 Capital investment to facilitate the shift to fuel-efficient equipment	 Provide data to government and policymaking authorities
 Allocation of funds to procure sustainable aviation fuel (SAF); investment in SAF producers	 Archive past environmental reporting literature (integrated reports, etc.)
 Green equity	 Provide data to potential investors

Figure 11: Investor survey

Project ideas	Data use ideas
 [Community revitalization] Use of fixed-point cameras to measure facility usage	 Investment impacts are easier to measure and more objective
 [Reduction of food loss] Monitoring of food waste and recycling	 <ul style="list-style-type: none"> •Standardizing the types of data used would improve comparability • Adopting an industry standard for impact measurement, which is currently on an individual project basis. In addition to reducing the burden for investors, this would lead to a market consensus on how impacts should be evaluated
 [Transition bonds] <ul style="list-style-type: none"> •Measurement of performance against targets (progress of demonstration experiments) •Measurement of select KPIs 	 Faster delivery of not only individual bond data, but also of the company's overall non-financial information for the benefit of investors
 [Sustainability-linked bonds] <ul style="list-style-type: none"> •Tracking of the percentage of managerial positions held by women 	 Executing trades based on investment impact data may be possible in the future
 [Green bonds] CO ₂ emission/power consumption of green buildings	

2) Opening the Green Tracking Hub to book-entry bonds

Some respondents suggested that it would be useful if the Green Tracking Hub could be opened to book-entry bonds in addition to digital bonds. While the advantages of security tokenization would be left unutilized, the website's ability to provide visual graphics of green metrics would be a benefit for book-entry bonds as well.

3) Retail product applications

The focus of the study panel was on corporate bonds for institutional investors, but some respondents pointed out that GDTB could also be attractive for environmentally conscious retail investors, and urged that products for that market segment be developed.

5. Financial institutions' appetite for digital green bonds, and the associated challenges

Securities firms were polled on their interest in digital green bonds. Of the four underwriters participating in the survey (as administrator of the study panel, Nomura was excluded), three indicated that they are positively inclined to handle digital green bonds. Their comments mentioned the market's growth potential and the significance of data tracking.

They were also asked about the core systems in place at their companies, and their answers highlighted three issues: 1) their back office pre-settlement reconciliation and DVP settlement systems lack the ability to handle digital bonds; 2) because digital bonds are processed using existing systems designed for non-digital bonds, some of the work is beyond the systems' capacity and must be done manually; and 3) their wholesale system is not designed for digital bonds and needs upgrading, but because it is operated jointly by multiple securities firms, there is little that each company can do on its own.

Then there is the need for multiple securities firms to constitute a working secondary market for digital bonds. That is, there must be a certain number of securities firms willing to buy an investor's digital bond holdings in the event that the investor decides to sell the bonds prior to their redemption date. If the investor can obtain a bid from only one source, it may not be a fair valuation; bids from at least two firms are desired. The number of securities companies active in secondary trading of digital bonds needs to be increased.

Going forward, the digital bond's viability as a financial product for institutional investors will hinge significantly on the securities sector's capacity to support the needs associated with this instrument. It will be one of the key determinants that shape the market's growth.

6. Challenges that need to be addressed for further growth

1) Amendments to the tax system

Article 8 of the Act on Special Measures Concerning Taxation stipulates the conditions under which financial institutions are given withholding tax exemptions. The current

version of the Act holds that interest earned on book-entry bonds qualify for this exemption, the rationale being that: a) because financial institutions earn income through interest rate margins, their interest revenues are the equivalent of sales revenues for other types of companies; it is therefore inappropriate that income tax of 15% be withheld from those earnings; and b) assessing this withholding tax would make bonds and savings a less viable use of financial institutions' capital compared to loans, and impair their ability to manage funds in a rational manner.¹

Based on current interpretation of the law, the Article 8 exemption applies only to book-entry bonds, and wholesale digital bonds are excluded from its scope. It should be noted that, even in instances where a financial institution incurs a withholding tax, the stipulations on income tax deduction set forth in Article 68 of the Corporation Tax Act allows the institution to deduct the withheld amount when it files its corporate tax returns, so the final tax liability will be the same. However, because the tax is withheld at the time interest payment is received, one aspect of the withholding is a negative impact on the institution's funding operations during that period. Furthermore, investors and the trust banks serving investors employ operational frameworks that were designed for book-entry bonds, which are exempt from withholding. Using the same frameworks for digital bonds, which are non-exempt, introduces complications.

A withholding tax exemption that applies only to book-entry bonds is believed to have its origins in a 1942 tax mechanism that gave preferential status to registered bonds, a type of bond whose holding period can be reliably ascertained. When a 2002 amendment replaced the Act on the Registration of Corporate Bonds, Etc. with the Act on Book Entry of Corporate Bonds and Shares, the Act on Special Measures Concerning Taxation was also amended, replacing registered bonds with book-entry bonds as the financial instrument with withholding tax exemption.

The fact that book-entry bonds also have ascertainable holding periods—thanks to the records kept in the Book-Entry Transfer Registers—is thought to explain why they enjoy the unique withholding tax exemption previously assigned to registered bonds. But digital bonds held and managed in brokerage accounts share this trait as well; the identities of their holders and holding periods can be clearly identified. It would seem, therefore, that in light of the spirit in which the tax mechanism was designed, withholding tax exemption would be applicable to these bonds as well.

¹ See page 113, "Clause-by-clause Explanation of the Circular on the Act on Special Measures Concerning Taxation Related to Filed and Withheld Income Tax, 2021 edition" (edited by Akira Kashida, Keiichiro Imai, and Naoto Kinoshita, and published by Okura Zaimu Kyokai, 2021)

A similar logic applies to tax exemptions for the interest income of public corporations, governed by Article 11 of the Income Tax Act. Under the current law, the exemption only applies to book-entry bonds, so any interest earned on wholesale digital bonds held by these organizations are subject to withholding tax. Again, if we assume that this privilege is limited to book-entry bonds because it is possible to ascertain their holding periods, it would seem reasonable to apply the same tax exemption to interest income from digital bonds held and managed in brokerage accounts for public corporations.

While GDTB's growth journey faces many challenges, such as added costs and liquidity, the withholding tax issue appears to present the biggest bottleneck for the future growth of the fledgling digital bond market; it is hoped that amendments to the laws will remove this obstacle. The operational challenges faced by securities firms and investors, such as DVP settlement, will be covered in the following sections, but it falls to the industry to address these issues as the market continues to evolve. Amending the tax laws would be a major step to help bring about these other changes.

2) DVP settlement

Digital currencies, including central bank digital currencies, are a form of currency that can be issued, settled, and managed via blockchains.

By recording both digital bonds and digital currencies on the same blockchain platform, securities instruments can be easily linked with specific funds, paving the way for a future in which transactions can be executed on a DVP basis with greater speed.

Introducing DVP would help alleviate settlement risks (the risk that a party to a transaction will fail to deliver security instruments or cash value when the other party has already fulfilled its part of the agreement) and systemic risks (the risk that the failure of a single financial institution will spill over to other financial institutions that trade its stock, inflicting significant damage to the entire market). These risks are further reduced by shorter settlement times: the less time a settlement takes, the smaller the outstanding balance of settlements, the fewer opportunities there are for failures to snowball, and the more likely it is that they will be resolved early.

At the moment, when processing digital bonds, the bonds themselves are settled via blockchain, while payments are settled on a non-blockchain network such as Zengin Net. Due to the use of these two disparate platforms, tasks such as confirmation of payment and the instructions and actual transfer of digital bonds within the blockchain are being performed separately and manually.

Resolving this inefficiency by building a system that allows the two settlement platforms to work with each other, like the ones employed for listed stock and book-entry bonds, would be a highly expensive undertaking. However, digital currencies, which are expected to be put to practical use, could give rise to a single platform capable of handling the settlement of both the bonds and payment.

And then there is the secondary market, where—even more so than in the primary market—security, reliability, and seamlessness are viewed as baseline requirements by investors. Some panel participants have commented that if the sector is serious about pursuing the possibilities of a secondary market for digital bonds, then DVP needs to be examined.

3) Expanding the market base

Figure 12 presents an outline of the digital bond's current risk profile measured against those of privately placed and publicly offered book-entry bonds.

One element that could hold digital bonds back is the number of bids investors can obtain when they try to sell these bonds before their redemption date. Many investors have indicated that they would like to receive a bid price from at least two sources.

At present, obtaining a purchasing bid from multiple securities is not a possibility for digital bonds. In many cases, security tokens are issued with the stipulation that they may not be sold to any party other than the underwriting securities company. This is not so much a systemic issue, but is due more to the relative newness of this asset type. Other securities companies may be unwilling to consider purchasing security tokens. Another issue is cost—digital bonds have not achieved the scale that would justify the outlay required to configure the token so that it can be sold to another securities firm. The sector will have to find ways to overcome these issues.

Securities companies were also asked about the core system they have in place to process digital bonds. Their answers revealed that 1) their back office processes are unable to handle the pre-settlement reconciliation and DVP settlements, and 2) because digital bonds are processed using existing systems designed for non-digital bonds, some of the work is beyond the systems' capacity and must be done manually.

In terms of investor-side operations (or, more accurately, the operations of custodian banks and securities brokers), book-entry bonds are processed on internal systems that interface with that of JASDEC. However, these systems are not yet equipped to handle digital bonds, which fall outside JASDEC's scope. Tasks such as the collation of principal

and interest, recording of post-withholding-tax interest, settlement data, and the generation of principal/interest vouchers must therefore be handled manually, making the administrative work much more complicated in comparison to book-entry bonds. So custodian banks too need to build their systems and capabilities.

Figure 12: Risk profile of digital bonds (relative to privately placed and public book-entry bonds)

		Digital bonds, both public and private	Privately placed book-entry bonds	Publicly offered book-entry bonds
Pricing of newly issued bonds		✓ With the digital bond market still in its early days, the issuer must negotiate terms with a limited pool of investors, whether the bonds are publicly offered or privately placed	✓ The issuer sets a marketing range and negotiates terms with a limited pool of investors according to the type of private placement	✓ The issuer sets a marketing range and negotiates terms with a wide pool of investors
Current market value data		✓ Prices provided by underwriting companies	✓ None (although the underwriting company may provide prices in some cases)	✓ JS Price and Reference Statistical Prices for OTC Bond Transactions
Liquidity in the event of sale	Normal market conditions	<ul style="list-style-type: none"> ✓ Some caution is required at present ✓ The digital bond market will need to attract more investors and securities firms 	✓ Sale is possible, subject to certain limitations (e.g., en bloc sale only, or to qualified institutional investors)	✓ Sale is possible
	Worsening market conditions	<ul style="list-style-type: none"> ✓ Some caution is required at present ✓ The digital bond market will need to attract more investors and securities firms 	✓ Sale is possible subject to certain limitations, but because the pool of potential buyers is small relative to publicly offered bonds, the seller may struggle to achieve their desired sale	✓ Sale is possible, but the terms (price, lot size, etc.) may not meet the seller's expectations

4) Secondary market and trading methods

As noted earlier, investors are calling for a mechanism that would allow them to sell their digital bond holdings prior to maturity. They are particularly unhappy that many of these instruments can only be sold to the underwriting securities company. There is strong demand for a mechanism to provide bids from more than one source, so that the seller can compare the proposed purchase prices.

There are also calls for improvements in how pricing information is supplied in the secondary market. Secondary trading of all bonds including ESG involves many operational aspects that have yet to be computerized. Prices are provided in the form of offer sheets delivered by email, making it inefficient for investors to gather information from multiple securities companies.

Another issue that was raised was the limited resources for investors wishing to obtain ESG data. The lack is particularly pronounced in secondary trading compared with the bond's original issue.

The study panel proposed that CONNEQTOR, the Tokyo Stock Exchange's RFQ platform for ETFs, could be one potential solution. CONNEQTOR allows institutional investors to trade ETFs over the Internet, helping to computerize the front end of trading. Institutional investors dealing in ETFs previously had to contact each securities company over phone or email to obtain their offer prices, but while some firms could supply a price immediately, others lacked a position on the product and had to negotiate with other market makers before returning with a figure. This could be a time-consuming process, and many were calling for a way to do this more efficiently.

Using CONNEQTOR, an investor can send out inquiries to multiple market makers simply by entering their order terms into the screen, which returns a list showing the various prices. After comparing the numbers, the investor can select the most favorable offer and execute the trade. Speeding up the investors' decision-making process also allows market makers to reduce their timing costs, leading to better prices.

An RFQ platform could also be useful in advancing the electronic trading of ESG and other bonds. JPX intends to conduct further research on the applications for RFQ systems, including feasibility studies, to examine what is desirable for the secondary market in the future.

5) Bond benchmarking

Launched in 1986, NOMURA-BPI (Nomura Bond Performance Index) is an investment revenue index developed to provide an accurate picture of the overall secondary market for domestically issued, publicly offered fixed-coupon bonds. The index has gained wide use among pension funds and other institutional investors as a key benchmark for domestic bonds, becoming one of the foremost bond indexes in the industry.

In order to facilitate wide adoption by institutional investors as a bond investment standard, NOMURA-BPI has certain criteria in place to determine whether to include a

bond in the index portfolio. From the perspective of the institutional investors' investment guidelines, whether or not digital bonds are included in NOMURA-BPI has significant implications for investment decisions; the question will likely be a major focus going forward as the sector endeavors to expand participation by institutional investors in the digital bond market. It should be noted that JPX's June 2022 issue of GDTB, with its maturity of one year and ¥500m issue value, did not meet the inclusion criteria for NOMURA-BPI; whether it is a book-entry or digital bond was not the determinant.

Figure 13: NOMURA-BPI's inclusion criteria

Issuance process	Publicly offered bonds issued in Japan	
Currency	JPY	
Coupon	Fixed	
Outstanding face value	1 billion JPY or more	
Term to maturity (scheduled redemption)	1 year or more	
Rating	JGBs, municipal bonds, government-guaranteed bonds, bank debentures	No rating criteria
	Corporate bonds, Samurai bonds, MBS, ABS	Equivalent to single-A or higher
Issue date	JGBs	Issues until the portfolio determination date
	Bank debentures	Issues until the last day of the month two months before the portfolio determination date
	Others	Issues until the last day of the month prior to the portfolio determination date

Source: Nomura-BPI Index Rulebook

http://qr.nomura.co.jp/en/bpi/docs/NOMURA-BPI_RuleBook_202303E.pdf

7. In closing (advancing the growth of sustainable investing in the Japanese market)

1) The rise in sustainability-linked bonds

Recent years have seen a rise in the issue of sustainability-linked bonds, a financial instrument whose coupon is linked to a green metric that the issuer has set (e.g., CO₂ emission reductions of 10,000 tons). The bond is structured with a common incentive for issuers and investors who share a concern for ESG causes.

In addition to responsible investment and ESG-focused themes, there has been a growing focus on engagement—pursuing active dialogue with investment targets over the medium to long term. Sustainability-linked bonds provide the impetus to further increase dialogue, helping to align the efforts of both investors and investees, and generating a positive cycle that benefits ESG goals.

As noted earlier, issuing a sustainability-linked bond as a non-digital bond introduces certain tasks that must be handled manually, such as verification of performance against targets and calculation of interest. This added workload makes the product costlier to manage. Theoretically, these costs come at the expense of returns, either in the form of green benefits or investment income, or through higher issuance cost.

With digital bonds, however, smart contracts can be designed so that certain types of data, such as CO₂ emission reductions, are automatically fed into a system that would then determine whether or not green targets have been met. In the future, even the calculation and payment of interest could be automated, and the technology could evolve to a point where even the most complex financial products can be managed at low cost. Holding down the operational costs for GDTBs through automation and efficiency gains would help maximize the environmental benefits of green bonds, be they digital or non-digital.

Green bond issuers are required in principle to obtain a second party opinion (third-party certification), and many believe that the decision by the Ministry of Environment and the Tokyo Metropolitan Government to subsidize the cost of fulfilling this requirement was a major factor behind the surge in green bond issuance. Developing a market for a product like GDTB also entails certain added costs (because green data is tracked digitally, the issuer would have to partner with blockchain firms and system vendors). Policy support such as a subsidy program would go a long way towards establishing GDTBs.

2) Conformity with the Green Bond Principles

The Green Bond Principles (GBP) comprise four core components:

1. Use of proceeds
2. Process for project evaluation and selection
3. Management of proceeds
4. Reporting

GDTB would help streamline tasks associated with components 1 and 4. Proceeds from JPX's bond issue were used to finance multiple power generation facilities. The planned allocation amounts for each facility have been graphed below to help visualize how the proceeds have been distributed within the project (Figure 14)

Figure 14: Example of graph showing planned allocation amounts for each facility



This report has made multiple references to how green metrics such as power output and CO₂ emission reductions are shown in real-time on the Green Tracking Hub interface. This feature helps improve reporting transparency—an important element of GBP—while the use of quantitative performance measures elevates the quality of impact reporting.

Japanese securities filings must now include disclosures about the firm's sustainability efforts, a requirement that applies to all reports for fiscal years ended March 31, 2023 or later. Regarding greenhouse gas emissions in particular, the regulation specifically states that while the business categories and business environment of each company, among other elements, will factor into determining the degree of materiality to the

company, the hope is that firms will disclose their Scope 1 and Scope 2 emissions proactively. Monitoring and reporting of emissions and other sustainability-related risks will become increasingly important.

3) Contributing to society through GDTB

Through seven meetings, the study panel invited participants to share their knowledge relating to JPX's digital green bond issue: the advantages and challenges of GDTB, the legal status of digital bonds, etc. The study panel also facilitated candid dialogue involving issuers, investors, and other stakeholders, who discussed how they view green investment and what they would like to see.

The discussions touched upon how green investing has evolved through the years as well as the size of the market, and highlighted the belief that, going forward, the bar for the quality of impact reporting will be set even higher. For the issuers and investors tasked with meeting these elevated expectations, a heavier burden of disclosure appears inevitable.

In order for sustainable financing to continue growing, it is critical for the sector to build a viable mechanism that does not drain the resources of any stakeholder and is geared towards common goals. GDTB's reporting function achieves major cost savings and efficiency gains to both issuers and investors. It is hoped that this will help bring down the cost of sustainable financing in Japan and cultivate a healthy fundraising market.

Although there have been numerous similar endeavors in markets outside of Japan, including digital sustainability-linked bonds and green bonds, GDTB is unique in its application of digital technology focused on monitoring. Because no other product like it exists, it has the potential to help the country grow into a leader in green financing. On the other hand, the largest foreign digital bond issues dwarf Japan's by orders of magnitude, and it would be remiss not to point out that some countries are providing all-out support to encourage the growth of digital bonds.

JPXI was recognized with two awards for its work on GDTB during the period when the study panel was being convened. At the fourth ESG Finance Awards Japan, hosted by the Ministry of the Environment, JPXI was honored with a Special Award in the fundraisers category, while JPXI shared the Sustainable Innovation Award with Nomura at the 8th Sustainable Finance Awards, hosted by the Research Institute for Environmental Finance. These recognitions and the feedback the panel has received from the 64 participants and other stakeholders indicate that GDTB has earned many

advocates. JPXI hopes to meet these expectations and contribute to the growth of sustainable financing in J Digital bonds in particular Japan by popularizing the GDTB mechanism.

■ Participating organizations (in alphabetical order)

ANA HOLDINGS INC.	Anderson Mori & Tomotsune
BOOSTRY Co., Ltd.	Custody Bank of Japan, Ltd.
The Dai-ichi Life Insurance Company, Limited	Daiwa Asset Management Co. Ltd.
Daiwa Institute of Research Ltd.	Daiwa Securities Co. Ltd.
Daiwa Securities Group Inc.	Development Bank of Japan Inc.
DNV Business Assurance Japan K.K.	Fujitsu Ltd.
Goldman Sachs Japan Co., Ltd.	Hitachi, Ltd.
Japan Airlines Co., Ltd.	Japan Bond Trading Co., Ltd.
Japan Credit Rating Agency, Ltd.	Japan Information Processing Service Co., Ltd.
Japan Securities Dealers Association	Japan Security Token Offering Association
JPX Market Innovation & Research, Inc.	Manulife Investment Management (Japan) Limited
The Master Trust Bank of Japan, Ltd.	Meiji Yasuda Life Insurance Company
Mitsubishi UFJ Morgan Stanley Securities Co., Ltd.	Mitsubishi UFJ Trust and Banking Corporation
Mitsui O.S.K. Lines, Ltd.	Mizuho Bank, Ltd.
Mizuho Securities Co., Ltd.	Mizuho Trust & Banking Co., Ltd.
Mori Hamada & Matsumoto	Nippon Life Insurance Company
Nissay Asset Management Corporation	Nomura Asset Management Co., Ltd.
Nomura Institute of Capital Markets Research	Nomura Research Institute, Ltd.
Nomura Securities Co., Ltd.	The Nomura Trust and Banking Co., Ltd.
The Norinchukin Bank	NTT DATA Corporation
Rating and Investment Information, Inc.	SBI SECURITIES Co., Ltd.
SHIMIZU CORPORATION	SMBC Nikko Securities Inc.
SoftBank Corp.	Sony Life Insurance Co., Ltd.
Sumitomo Life Insurance Company	Sumitomo Mitsui Banking Corporation
Sumitomo Mitsui DS Asset Management Company, Limited	Sumitomo Mitsui Trust Bank, Limited
Sustainalytics Japan Inc.	Tokai Tokyo Financial Holdings, Inc.
Tokai Tokyo Securities Co., Ltd.	Tokyo Realty Investment Management, Inc.
XNET Corporation	

64 organizations in total (including some that are not listed here)