"New Asset Class: Deep Dive into Infrastructure Asset-Backed Securities"

Bayfront Infrastructure Management ("Bayfront") was established in 2019 in connection with the Infrastructure Take-Out Facility ("TOF") initiative, which was designed and structured by Clifford Capital to help mobilize institutional capital for infrastructure debt in Asia through issuance of infrastructure asset-backed securities ("IABS"). AIIB has been supporting this initiative as a 30% shareholder of Bayfront since inception, with the investment closely aligned with AIIB's objectives of developing Asian infrastructure as an asset class and supporting private capital mobilization. Bayfront launched its debut IABS on 18 June 2021. This sponsored document seeks to provide information regarding IABS, including relative value compared to existing structured finance products, for research purpose only and should not be considered marketing and solicitation of securities. CLO Research Group is an independent research firm with no connection to Bayfront, AIIB, and underwriters of past and future IABS, other than being commissioned to provide independent research of this new asset class. This paper was first and originally published on March 23, 2022 at www.bayfront.sg.

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1. Infrastructure ABS (IABS) Highlights

Introduction

Infrastructure assets are widely known as the physical structures, networks, and other facilities that provide vital services needed for the operation of a society or enterprise. They are essential to economic productivity as well as social and ecological development and the population's general wellbeing.

They typically include transportation assets (such as toll roads, bridges, railroads, seaports, airports), communications assets (wireless networks, cable systems, satellite networks, data centres), regulated assets (electricity transmission lines, utilities, water systems), energy assets (power generation and midstream assets such as pipelines) and social assets (schools, hospitals, etc.).

About the Author

Poh-Heng Tan, CFA

Before setting up CLO Research Group, Mr. Tan worked at the Blackstone Group from July 2008 to March 2019, where he served as a portfolio manager (SMAs) and trader of global Collateralised Loan Obligation (CLO) securities.

Mr. Tan was also involved with the analysis of U.S. and European CLOs, including performing diligence on CLO managers, as well as analysing underlying portfolios and CLO structures. He also sat on the Global Structured Credit Investment Committee.

Prior to joining the Blackstone Group in 2008, Mr. Tan worked at Washington Square Investment Management, a specialist structured credit investment manager in London where he was part of the team managing a CLO vehicle listed on the London Stock Exchange. He was also part of the team that created an in-house Monte Carlo simulation model for the analysis of CLO investments.

Earlier in his career, Mr. Tan worked at DBS Bank, S&P, IDEAglobal and IBJ focusing on fixed income, loan and structured credit products.

Mr. Tan received his Bachelor's Degree with a major in Financial Analysis from Nanyang Technological University, Singapore. He was awarded the Ernst & Young Gold medal for Derivatives Securities Analysis and is a CFA Charterholder.

Author's Thoughts

The performance of securitised products, particularly CLOs, has been well-publicised thanks to their solid track record with very low default rates through credit cycles. As a result, the global CLO market has grown tremendously and is now over US$1 trillion in AUM.

When I first learned about IABS, it seemed to me a natural extension of the securitised product market.

Investors are always looking for ways to diversify their holdings. It is great to see new senior secured collateral assets coming out of Asia-Pacific and the Middle East. Investors now have another option to pick up investment-grade floating-rate securitised tranches, this time backed by senior secured infrastructure and project finance loans with a long track record.

The securitisation rating methodology for IABS is similar to that of CLOs. With the well-established CLO structure, coupled with a long performance track record of the collateral assets in terms of default and recovery rates, I expect IABS would quickly gain broader investors' acceptance globally.

Besides, IABS' recent inclusion of a sustainability tranche is an excellent contribution to the blueprint for a net zero or lower carbon future. This tranche attracted strong demand and even derived a 'greenium' (pricing at a tighter spread than an equal ranking conventional tranche). Increasingly, major institutional investors nowadays are focused not just on maximising economic returns, but social returns as well. Investing in a tranche (or an entire securitisation) where proceeds are specifically used to finance eligible green or social assets fits nicely within this new global paradigm. In the context of infrastructure development, this ability to link underlying green and social projects – such as renewable energy generation, water desalination plants or rural transportation and transmission grids – to dedicated sustainability bonds is an important financing tool in achieving global climate reduction targets such as the Paris Agreement or meeting some of the United Nations Sustainable Development Goals.

The IABS programme that is the focus of this piece is backed by reputable institutions with a strong alignment of interests to further develop the infrastructure financing landscape in Asia. The average Baa3/Ba1 rated senior secured quality of the underlying collateral pool differentiates it from regular CLOs and other securitised products.

Having said that, the relatively concentrated underlying collateral pool is something that would naturally demand more attention.

Therefore, it is important to delve deeper into the manager, portfolio quality, and structural protection of IABS.

Notably, the majority of the underlying assets are rated investment grade and their potentially above-average recovery rates, coupled with the rating agency's conservative approach to rating each issuance, help mitigate these challenges.

As with most securitised products, fixed income investors are compensated for the complexity and liquidity risk. Besides, with rising rates, investors might find highly rated floating-rate assets more appealing.

Product Highlights

- **Quality**: Rated tranches (all rated investment grade) are backed by a pool of high quality, senior secured, first lien project and infrastructure loans
- **Diversified access**: Gain access to infrastructure loans across multiple geographies (including developed and emerging markets) and sectors
- **Track record**: Project and infrastructure loans have a long track record of good performance, exhibiting lower default and higher recovery rates than leveraged corporate debt
- **Steady cashflows:** Infrastructure projects are vital to the functioning of their host economies and typically underpinned by long term revenue contracts, contributing to stable and predictable cash flows
- **Structural strength and resilience:** Rated tranches are structured to withstand multiple times the base case default rate (*refer to analysis in Section 8*)
- **Alignment of interest**: Risk retention via both sponsor and originator routes
- **Reputation**: IABS sponsor and manager's funding is backed by the Government of Singapore (AAA/Aaa rating)

Overview of the Sponsor: Bayfront Infrastructure Management

Bayfront Infrastructure Management Pte. Ltd. ("Bayfront") was established in Singapore in November 2019 to help mobilise institutional capital for infrastructure financing primarily in the Asia-Pacific region.

Mission:
- To address the infrastructure financing gap in the Asia-Pacific region by facilitating the mobilisation of private institutional capital into the infrastructure financing market through IABS.
- To help unlock more capacity for infrastructure financing by banks, who have traditionally been the largest lenders in this sector, by allowing them to recycle their capital and liquidity through selling their loans to Bayfront.
- Championing Singapore as Asia's leading infrastructure financing hub

Shareholders – 70% owned by Clifford Capital Holdings Pte. Ltd. ("CCH") and 30% owned by the Asian Infrastructure Investment Bank ("AIIB") (AAA/Aaa/AAA rating)*. The shareholders of CCH comprise Temasek Holdings, the Asian Development Bank, Prudential Assurance Company Singapore, Standard Chartered Bank, Sumitomo Mitsui Banking Corporation, DBS Bank and Manulife.

Bayfront's funding sources:
- Equity: CCH and AIIB
- Debt: Borrowing is backed by the Government of Singapore, which provides a 10-year guarantee of up to $2bn in debt capacity
    - Bayfront reports its key financial ratios and portfolio performance on a quarterly basis to the Government of Singapore

*"*AIIB has invested in Bayfront because it has the potential to reap benefits for multiple stakeholders along the infrastructure value chain. IABS provides institutional investors with an instrument to obtain diversified exposure in infrastructure debt across various jurisdictions and industry sub-sectors. It also helps the banking sector to recycle capital and secure liquidity, in order to support more projects that can further spur economic growth and social development. In the long term, it helps develop infrastructure debt as an asset class and mobilise private capital. Infrastructure sponsors will be the ultimate beneficiaries of a more liquid, transparent and diversified funding environment for infrastructure projects around the region."*
- Stefen Shin, Principal Investment Officer - Capital Markets & Structured Products.

"Bayfront is committed to building IABS as a liquid and readily accessible asset class which has the potential of offering institutional investors access to the rapidly growing infrastructure sector in Asia Pacific. We believe a key element of the programme entails investor education around structure and attendant benefits. Its novel features, including a focus on sustainability, give it unique appeal among investors seeking exposure to infrastructure debt in an attractive risk-reward format."

- Premod Thomas, Chief Executive Officer, Bayfront Infrastructure Management

2. Investor Types

IABS caters to a range of investors (please see Appendix 4), by virtue of offering investors a menu of different risk-reward, ratings vs. spreads options across various tranches.

1. Bank treasuries, who invest mainly in the AAA-rated senior tranches due to attractive risk-reward propositions, lower capital charges etc.

2. Insurance companies and pension funds, who invest in a mix of senior and mezzanine tranches – the former for their lower capital charges and higher ratings, the latter for their longer duration (to match the nature of life insurers and pension funds' liabilities) and higher yield.

3. Asset managers who can invest across the capital stack, depending on their mandate and risk appetite.

For the latter two groups in particular (insurance/pension and asset managers), IABS offers them an opportunity to access infrastructure investments, whereas banks have traditionally possessed the relevant domain knowledge and human resources to properly evaluate infrastructure investments – being the largest non-government financiers of infrastructure projects through bank loans.

Aside from investing in IABS, banks (as asset originators and owners) also stand to benefit from the IABS programme, as the IABS sponsor provides them an outlet to sell down loans, thereby recycling capital and liquidity to allow them to originate new loans

and help bridge the infrastructure financing gap in many countries, particularly in the Asia-Pacific region and many other emerging markets.

3. Comparison between IABS and other Securitised Asset Classes

Comparison between IABS and CLOs

Metrics	IABS – BIC (2018)	IABS – BIC2 (2021)	US BSL CLOs (2021)	US MM CLOs (2021)	EU CLOs (2021)
Weighted Average Spread (WAS) of underlying collateral pool (1)	250bp	230bp	Around 350bp	Around 570bp	Around 380bp
Risk Retention (2)	10% risk retention / full equity retention – Risk retention at the sponsor **and** originator levels	10% risk retention / full equity retention – Risk retention at the sponsor **and** originator levels	Not required	Not required	5% risk retention: sponsor or originator structure (legal requirement)
Sustainability tranche	NA	$120 million issue (part of Class A)	NA	NA	NA
Deal upfront costs	Upfront costs and expenses were borne by Clifford Capital as the sponsor, rather than at the deal level	Upfront costs and expenses were borne by Bayfront as the sponsor, rather than at the deal level	Upfront costs are charged to the deal	Upfront costs are charged to the deal	Upfront costs are charged to the deal
Weighted average life (WAL) of underlying collateral pool	5 to 6 years	5 to 6 years	Typically, 8 to 9 years based on their WAL test	Typically, 8 years based on their WAL test	Typically, 8 to 9 years based on their WAL test
WARF (see Appendix 2)	722 (or 975 after notching adjustment by Moody's) (722: between Baa3/Ba1)	748 (or 937 after notching adjustment by Moody's) (748: between Baa3/Ba1)	Around 2700 (2700: between B1/B2, closer to B2)	Around 3520 (3520: between B3/Caa1, closer to B3)	Around 2870 (2870: between B2/B3, closer to B2)
B+ and lower rating (underlying collateral pool)	0.05%	0.2%	Around 85%	NA	Around 93%

MVOC (BBB) (Market value of underlying collateral/(sum of AAA–BBB tranches)	111.1%	111.1%	114.4%	124.6%	117.2%
Reinvestment during reinvestment period (3)	Only replenishment is allowed. No discretionary trading is permitted.	Only replenishment is allowed. No discretionary trading is permitted.	Discretionary trading is allowed	Discretionary trading is allowed	Discretionary trading is allowed
Reinvestment (RI) period (3)	2 years	3 years	Typically 5 years	Typically 4 years	Typically 4.5 years
Non-call period (3)	4 years	3 years	Typically 2 years	Typically 2 years	Typically 1.5–2 years
Reinvestment post reinvestment period (3)	Not allowed	Not allowed	Allowed subject to various criteria	Typically not allowed	Allowed subject to various criteria
Recent AAA tranche pricing (bp)	NA (priced in 2018)	120-125 (3-yr RI)	110s (5-yr RI)	140-160 (4-yr RI)	Less than 100 (4.5-yr RI)
Diversity score	NA	NA	Around 78	Around 38	Around 54
Number of underlying issuers (4)	25-30	25–30	Averaging around 250	Averaging around 70	Averaging around 130
Countries	Asia Pacific and Middle East, including Emerging Markets (16 countries)	Asia Pacific, Middle East and South America, including Emerging Markets (13 countries)	US	US	Western Europe

| Collateral liquidity score (W. Avg Depth) (5)	NA	NA	5.7	2.5	5.6
% of collateral not priced	NA	NA	1.0%	73.2%	3.8%
Covenants for underlying collateral (6)	Detailed covenant package including reserve accounts, dividend restrictions, debt service covenants with a high level of monitoring on performance	Detailed covenant package including reserve accounts, dividend restrictions, debt service covenants with a high level of monitoring on performance	Predominantly cov-lite	Largely covenanted	Predominantly cov-lite
Sustainable assets	NA	46% of the BIC2 portfolio are eligible sustainable assets	NA	NA	NA
Underlying asset repayment schedule	Typically amortising	Typically amortising	Typically bullet	Typically bullet	Typically bullet
Management fees (Total)	10bp	20bp	Around 40bp	Around 60bp	Around 45bp
Net interest margin (Collateral margin less WACC) (7)	Less than 100bp	Less than 100bp	Around 185bp	Around 350bp	Around 200bp

Source: Moody's, Intex, CLO Research, LPC (as of 25 Nov 2021)

Comparison between IABS and other ABS Asset Classes

Securitisation Asset Class	IABS	Prime Auto ABS	Student ABS	Credit Card ABS	Agency MBS
Collateral secured	Yes	Yes	No	No	Yes
Typical rating of collateral	BB to AAA (with credit wrap)	NA	NA	NA	NA
Number of collateral per deal	20-50	1,000 to 10,000+	1,000 to 10,000+	300 to 10,000+	300 to 1,000+
Typical AAA tranche credit spread (bp)	Low 100s	12–15bp (2–3 years)	50–75bp (3–7 years)	17–60bp (3–7 years)	40–50bp
Geographical diversity	High	Low/Medium	Low/Medium	Low/Medium	Low/Medium
Key credit drivers	Credit estimates of loans, diversification, correlation, recoveries, ECA/MFI covers, nature of loans etc.	Sized by an assessment of historical PD and LGD (taking into account any proceeds from enforcement against the automotive loans etc.	Driven by an assessment of the borrower's willingness and capacity to pay, in granular portfolios, and loss severity assessments	Driven by an assessment of the borrower's willingness and capacity to pay, in granular portfolios, and loss severity assessments	Sized based on the ability of the borrower to make their repayments, with loss severity primarily driven by the amount of equity in the residential property if a default occurs

Source: Bayfront, IGM

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AAA Tranche Pricing Comparison
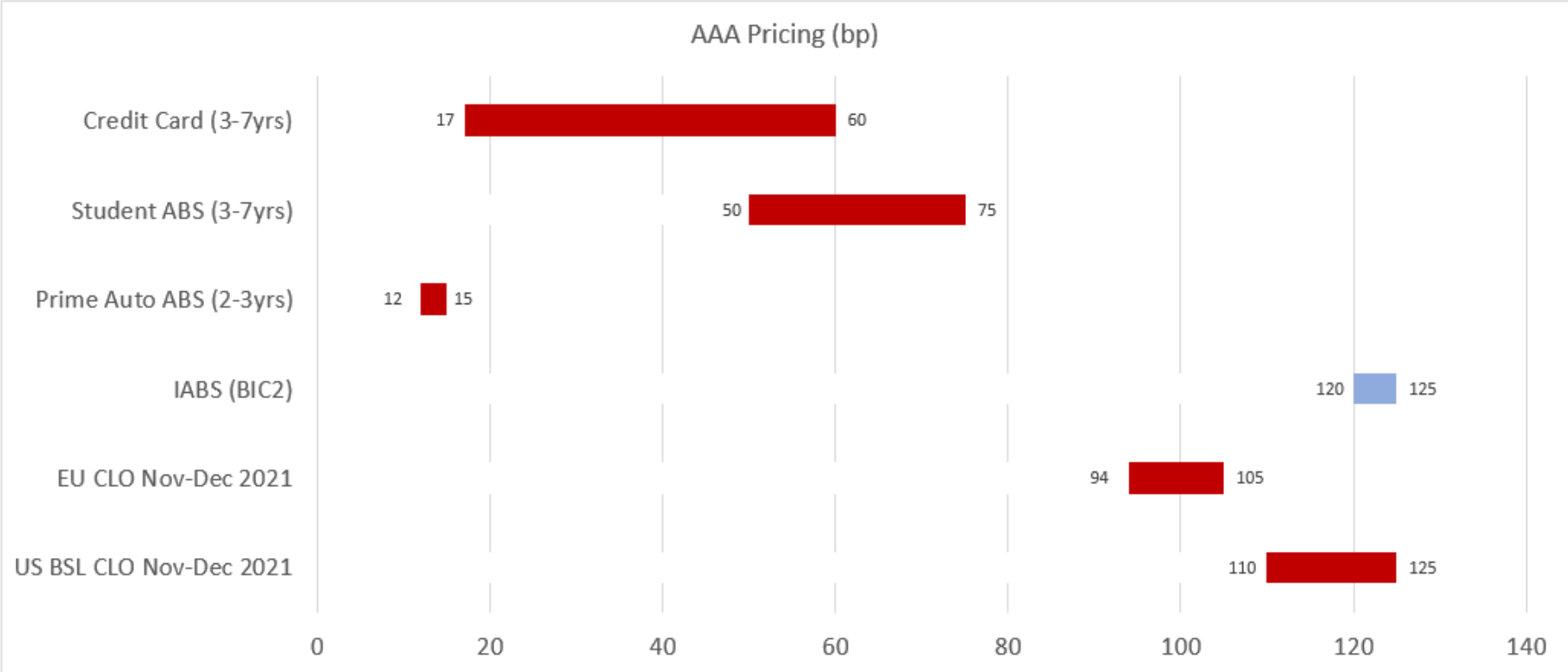
Source: Intex, Bayfront, Citi

Track Record of project and infrastructure loans

The table below shows the track record of the underlying collateral assets, comparing their default rates and recovery rates:

Track Record of underlying collateral assets	Project Finance loans	Global Leveraged Loans
Average 10-year cumulative default rate – Moody's definition)	3.9%; The implied cumulative default rate for loans backed by operational projects globally is lower at 2.1%	34.17% (for B rating) 15.19% (for BB rating)
Average ultimate recovery rate – Basel definition	79.1% The most likely RR is still 100%, in 60.5% of cases	48.5%–58.1% (2019–2020) 72.6% (1987–2020)
By Regional subset – time horizon 1995-2019 (10-year cumulative default rate – Basel definition)	7.1% (EMDE-A)[1] 7.4% (EMDE-B)	
By Regional subset – time horizon 1995-2019 (Average Ultimate Recovery Rate – Basel definition)	78.4% (EMDE-A) 77.0% (EMDE-B)	

Source: Moody's

- As seen in the table above, project and infrastructure loans have a long track record of good performance, exhibiting lower default and higher recovery rates than leveraged corporate debt.

IABS also offers structural benefits:

(i) Underlying infrastructure debt provides several positive features (e.g. higher recovery rates (especially for ECA/MFI covered loans), contracted long-term revenue streams with creditworthy counterparties, geographical and industry sector diversity) that are less prevalent in some consumer structured finance sectors.

(ii) Infrastructure debt has demonstrated robust performance during the COVID-19 pandemic, given the critical nature of infrastructure projects to their host countries where usage/performance is potentially more insulated from the economic and business cycle. In contrast, some securitised product classes could potentially be more susceptible to the general economic or business cycles.

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[1] Emerging markets and development economies (EMDE).
EMDE-A: A subset comprising projects located in countries that the World Bank Group classified as non-high-income (meaning upper-middle-income, lower-middle-income or low-income), on average over the period 1995-2019, but excluding certain US dependent territories.
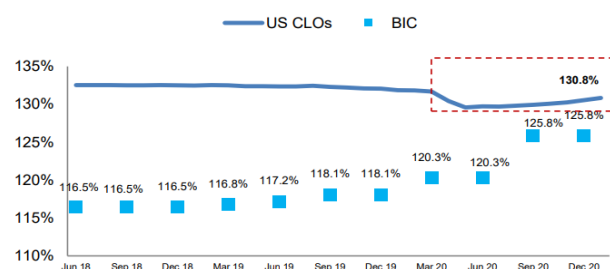
EMDE-B: A subset comprising projects in the EMDE-A subset but excluding non-high-income EEA countries and non-high income OECD countries.
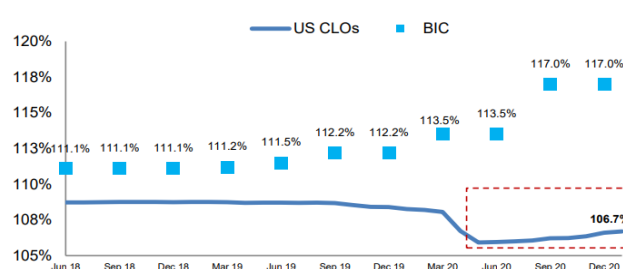
Performance through COVID

CLO WARF
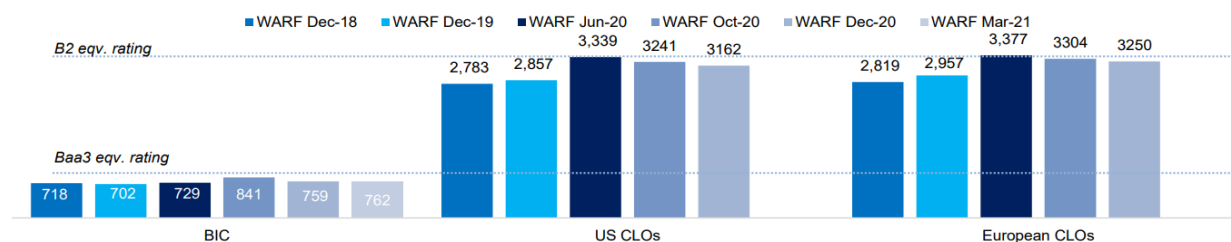
Median Senior OC Ratios

Median Junior OC Ratios

Source: Bayfront, Moody's

- BIC's WARF trend through the pandemic exhibits a lower risk profile and a greater resilience compared to regular CLOs. For example, BIC's WARF increased by only 112 points from 729 to 841 in one quarter as compared to 482 points change experienced by US CLOs (Please see Appendix 2 for the WARF-implied rating table).

- Notably, BIC's overcollateralisation (OC) ratio has consistently trended higher throughout 2020 due to the amortisation of its capital structure and thanks to its underlying collateral's scheduled principal repayment rate, which is fixed at the financial close of each project/loan and is not conditioned by market conditions. Typically, conditional prepayment rate for CLOs would be much lower in times of volatility.

- Some of IABS' structural features (e.g., no reinvestment post reinvestment period, immediate principal amortisation of the most senior tranche even before reinvestment end-date and no discretionary trading of collateral) also allow a faster build-up of credit enhancement compared to traditional CLO structures.

Key structural differences between IABS and CLOs

(1) Weighted Average Spread (WAS) of underlying collateral pool

IABS' portfolios have a much lower weighted average spread than both US and EU CLOs.

This highlights the fact that IABS' portfolios are of higher credit quality compared to the regular CLOs from a credit spread perspective.

(2) Risk Retention

Bayfront is committed to holding no less than 5% of the capital structure of its IABS issuances, in complying with minimum retention requirements. In both Bayfront Infrastructure Capital (BIC) and BIC2, Bayfront retained 100% of the equity, which comprised 10% of the capital structure for each issuance.

To build the collateral portfolio, Bayfront buys loans from originator banks, who are then typically required to commit to holding at least 30% of their pre-sale exposure in the loans sold to Bayfront.

This demonstrates a double layer of risk retention, at the sponsor (Bayfront) level with respect to the equity tranche of the IABS, and the originator (selling banks) level with respect to the underlying collateral.

Overall, the alignment of interest here is strong compared to the minimum 5% risk retention requirement in the EU CLO landscape.

BIC 2 has investors that require their investments to satisfy the EU Risk Retention standard (Please see Appendix 4 for the geographical breakdown on the investor base of BIC2).

(3) Reinvestment post reinvestment period and non-call period

BIC2 has a relatively short reinvestment period of 3 years and a longer non-call period compared to US and EU CLOs.

Typically, US and EU CLOs would see around 1-year non-call period for a 3-year reinvestment deal, but BIC2 has 3-year non-call period instead

The non-call period is one of the important considerations for senior tranche holders. As a deal matures and its WAL shortens, CLO tranches tend to price tighter, and hence a longer non-call protection is valuable for senior debt investors, especially for senior tranche investors. In other words, senior debt tranches would not be subject to repricing risk within a short period of time.

IABS has a longer non-call period and shorter reinvestment period, which compares favourably to the regular US and EU CLOs.

Most CLO deals would allow reinvestment post the end of the reinvestment period, subject to various reinvestment criteria. However, BIC2 would not be able to replenish assets post its reinvestment period.

(4) Concentration / Number of issuers

The BIC2 portfolio is highly concentrated as compared to US and EU CLOs. The BIC2 portfolio only includes 27 loans relating to 25 projects, with considerable exposure to a few of them.

Having said that, Moody's has correlated loans at 100% for those that relate to the same projects or same loan guarantor so that when one of them defaults, all of them will default in the same simulation. This is important to ensure that the portfolio tail risk is captured correctly.

Another mitigant is that only 23% of the portfolio has a credit spread of over 3%, and less than 5% of the portfolio has a spread of over 4%. While the portfolio is highly concentrated, it is mitigated by higher credit quality as shown by its WARF, as well as its tight credit margin (spread).

	Exposure to projects
1	7.5%
2	7.2%
3	7.0%
4	6.2%
5	5.1%
6	5.0%
7	5.0%
8	4.8%
9	4.7%
10	4.4%
11	4.2%
12	3.9%
13	3.7%
14	3.7%
15	3.5%
16	3.3%
17	3.2%
18	3.2%
19	2.9%
20	2.7%
21	2.5%
22	2.3%
23	1.2%
24	1.2%
25	1.2%

(5) Underlying collateral liquidity

Unlike US BSL and EU CLOs, the underlying collateral assets of BIC2 are very illiquid with no readily quoted market prices given the nature of the asset class.

This could be a plus as this could translate to less market price volatility at the collateral level and at the BIC2 tranche levels.

(6) Covenants

Now that cov-lite lending has become the norm in the leveraged loan market, what does that mean for recoveries?

According to S&P Global LossStats, looking at term loans issued after the Global Financial Crisis, and excluding second-lien facilities, cov-lite term loans have underperformed, recovering 61% on average, versus 70% for all loans issued over the same period.

On the other hand, IABS' collateral pools are comprised of loans with detailed covenant package including reserve accounts, dividend restrictions, debt service covenants with a high level of monitoring on performance.

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4. Securitisation Format

Bayfront uses securitisation technology broadly similar to that of CLOs in structuring its IABS. Please refer to Appendix 1 for '**How Does CLO Securitisation Work?**'

The following Sections 6 to 9 are solely for information purposes.

A reference to a particular investment or security, a credit rating or any observation concerning an investment or security provided in this research document is not a recommendation to buy, sell or hold such investment or security or make any other investment decisions and does not address the suitability of any investment or security.

This research document should not be relied on and is not a substitute for the skill, judgment and experience of users, its management, employees, and/or advisors in making investment and other business decisions. **(Please read the Disclaimer at the end of this document)**

5. Understanding Rating Agency's Approach to Rating IABS

In Moody's credit analysis of IABS, they consider the attributes of the underlying assets, including the assets' average default probability, average recovery rate, asset correlation, loan participation exposure, average life, average spread, industry sectors and sub-sectors and geographical concentration.

Moody's measures the credit risk of the rated liability classes (rated notes) using a model, which calculates the Expected Loss (EL) for each rated tranche, which incorporates the default and recovery characteristics of the underlying assets. Any such model consists of two primary components:

- A mechanism for associating collateral default and loss scenarios with the likelihood that each such scenario will occur (analysed using Moody's CDOROM).

- A cash flow component that relates each collateral default scenario to the cash that flows to the rated notes within that scenario (analysed using Moody's CDOEdge).

Once Moody's has applied such collateral default scenarios to the cash flow model, it is possible to calculate the EL for each rated tranche. The final step is to compare the computed EL for each tranche to a set of benchmarks to determine the model output rating for the tranche.

Moody's idealised EL rates represent the benchmark ELs associated with each rating category over various time horizons (refer to Appendix 3). Moody's assesses the model output by comparing the note's calculated EL and weighted average life (WAL) to these benchmarks.

Expected loss and modelling analysis
Moody's applies the Monte Carlo simulation framework in CDOROM to model the portfolio loss distribution. The simulated defaults and recoveries for each of the Monte Carlo scenarios define the pool's loss distribution.

CDOEdge is a cash flow model focused more on the liability side (the notes). Moody's inputs pool default and recovery assumptions, which maintain the pool loss distribution generated by CDOROM. Other modelling assumptions – such as recovery delay, portfolio amortisation schedule and yield vector to the model, are used to estimate the expected losses on each tranche within a transaction. The CDOEdge model incorporates various scenarios for default timing and interest rate paths and allocates the cash flow arising from the portfolio in accordance with the priority of payments stated in the transaction's documentation.

In practice, the collateral pool default distribution scenarios generated from CDOROM are aggregated into many different default buckets with an associated probability of occurrence. Each default scenario is then inputted into the CDOEdge model.

Moody's considers cases in which the defaults within a given scenario occur over the first six years of the transaction, with 50% of scenario defaults occurring in one year and 10% in each of the other years. The 50% default spike is intended to mimic the bunching of defaults in a recession. The spike is moved through each year for a total of six default-timing scenarios.

Please see below for some of the Moody's top-level modelling inputs for the Bayfront Infrastructure Capital II (BIC2) transaction that was issued in June 2021[2] *(source: Moody's New Issue Report on BIC2, dated 18 June 2021)*:

Weighted average rating factor (WARF): 748 (before credit estimate notching adjustment) / 937 (after credit estimate notching adjustment)
- Credit estimate adjustment: Moody's applies a two-notch haircut on credit estimates related to the largest loans representing 30% of the pool. This adjustment is primarily to account for the unmonitored nature of credit estimates[3] (hence, credit estimates are subject to potentially higher volatility than ratings) and also the fact that credit estimates are typically assigned based on limited analyses compared to those for ratings. Moody's expects to review the credit estimates as the collateral manager requests and at least once every 12 months from each of the last assignment dates.

Weighted average life (WAL in years): 5.9 years
- This is to recognise the fact that BIC2 is largely a static deal as replenishment is only allowed during the investment period.

Asset correlation: 26% (on average)
- This average asset correlation number has captured the intra-sector and inter-sector pairwise asset correlation as well as adjustment for different continental regions and countries.

Weighted average recovery rate (WARR): 74%

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[2] Source: Moody's New Issue Report on BIC2, dated 18 June 2021
[3] Credit estimates represent a point-in-time estimate by the rating agency on the creditworthiness of the obligor and are typically refreshed only annually or in cases of material changes, whereas public ratings are meant to be dynamic representations of creditworthiness and are constantly monitored by the rating agency.

- The weighted average recovery rate captures factors that determine recovery rates such as sector classification, the relevance of construction phase of the underlying project, and the degree of government support. Moody's does consider a higher recovery rate assumption for certain assets, such as availability-based projects in operational phase or in advanced stages of construction phase if they exhibit features such as exceptional levels of support from highly rated off-takers and lower-than-typical operating risk. Project loans that benefit from meaningful external credit support, for instance from export credit agencies (ECAs) or multilateral financial institutions (MFIs), would also warrant a higher recovery rate assumption.

The EL for each tranche is simply the weighted average of losses allocated to each tranche across all the scenarios, where the weight is the likelihood of the scenario occurring.

The EL of a tranche is associated with a particular horizon to compare the EL to Moody's benchmark for that horizon. The relevant horizon is the WAL of the tranche. The model output reflects the comparison of the calculated EL for each liability to a set of benchmarks that represent the target EL for a given rating level and average life (please see Appendix 3).

Moody's considers stress scenarios assuming higher asset correlation or by notching down the credit estimates on a portion of the pool in which the projects are expected to be more susceptible to declining commodity prices.
Moody's also considers other stress scenarios assuming generally higher asset correlation across the entire pool. Moody's determines that the potential rating volatility of the notes under these scenarios is acceptable when assigning the tranche ratings.

6. Introduction to IABS Manager

IABS Manager: BIM Asset Management Pte. Ltd. ("BIMAM"), a wholly-owned subsidiary of Bayfront.

Investment professionals and process
- 12 full-time staff, of which 11 are investment/finance professionals
    - Average 15 years of experience
- Four senior management – CEO + 3 department heads for the following teams:
    - (i) Structuring & Distribution – responsible for structuring and marketing of IABS securitisations, working with rating agencies and external advisers, investor relations work;
    - (ii) Loan Acquisitions – responsible for sourcing, reviewing and presenting potential loan investments to the Executive Committee for acquisitions;
    - (iii) Risk – responsible for monitoring of loan investments post acquisition.

Approval
- A 4-person Executive Committee, comprising the CEO and 3 other senior representatives from parent company CCH, approves all investments
- A 5-person Board oversees management and approves any exceptional investments outside of risk criteria.

Risk Group – Gatekeeping and Monitoring
- The Risk team is headed by the Chief Risk Officer (CRO) – with one sub-team comprising of the three persons who directly sit in Bayfront, and another four members who are based at CCH Group level and who monitor the market, liquidity and operational risks for all the operating companies of the CCH Group. They perform tasks like annual macroeconomic stress testing, IBOR transition impact studies, update of internal rating methodologies etc.
- The Risk sub-team for Bayfront is comprised of 3 members (including the CRO). The risk team are the first level of gatekeepers, and they ensure that all possible risk factors are covered with mitigants in place. They work together closely with the Loan Acquisitions team. Operational performance of each project, ongoing monitoring, waivers and amendments are covered by the Risk personnel.

Support professionals
- "Insourcing" support from the parent holding company CCH for middle and back-office functions – finance, treasury, operations, IT, compliance, legal, HR, and administration. Some employees dedicate most or 100% of their time to supporting Bayfront alone. In addition to Bayfront's full-time staff, all other functions are adequately covered by this service arrangement with the parent company.

Number of credits per analyst
The Loan Acquisitions team is comprised of 4 members – on average, each analyst covers around 40–50 loans. This team is in charge of sourcing the loans for the warehouse before they are securitised into IABS.

Typically, it takes around 1 to 3 months from the expressions of interest stage to the investment committee approval of investments.

Turndown rate

The turndown rate was around 70%. On average, out of 100 individual loans identified, Bayfront carried out detailed due diligence on around 50 loans, 40 loans made it to the investment committee, and 30 were approved.

Issuance plan

Bayfront expects to issue IABS every 12–15 months.

E&S Framework

Bayfront predominantly acquires debt financing projects that are fully operational or are close to completion, mostly from banks that have adopted the Equator Principles and therefore have already been subject to environmental and social (E&S) due diligence conducted by the original bank lenders prior to financial close. Nonetheless, prior to any acquisition or commitment, Bayfront still screens all loan investments through its E&S Framework, which is designed to effectively identify, assess and manage the E&S risks of each loan.

Governance Risk Assessment Process

Bayfront also has an internal governance risk review process to assess and evaluate governance-related risks of its investments.

Sustainable Finance Framework

Bayfront has developed a Sustainable Finance Framework to demonstrate how they intend to issue green, social or sustainability notes through IABS. Sustainability notes are notes where the proceeds will be applied to finance or re-finance a combination of both eligible green loans and eligible social loans, as defined in the Sustainable Finance Framework.

The issuance of green, social, or sustainability notes will help deliver positive environmental and/or social outcomes, supporting Bayfront's sustainability strategy and vision.

Senior management biography

- Mr. Premod Thomas is the CEO. Premod heads Bayfront Infrastructure Management and is responsible for the strategic leadership and vision of the company. He was previously Head of Corporate Strategy at Clifford Capital, where he oversaw the conceptualisation and execution of the inaugural Infrastructure Take-Out Facility by Bayfront Infrastructure Capital in July 2018. Prior to that, he spent several years with Bank of America, Standard Chartered Bank and the Temasek Group, focusing on corporate finance, mergers and acquisitions, and new businesses. In addition to his executive role with Bayfront, Premod holds non-executive directorships in a number of companies including Singapore-listed Mapletree Commercial Trust, MGSA Private Trust and Gemstone Asset Holdings. He holds an MBA from the Indian Institute of Management, Ahmedabad and a Bachelor of Commerce from Loyola College, Madras.

- Mr. Nicholas Tan is the Chief Operating Officer and the head of Structuring & Distribution. He was previously a Senior Director in Corporate Strategy at Clifford Capital, where he led the structuring, execution and management of the Infrastructure Take-Out Facility by Bayfront Infrastructure Capital in July 2018. Before joining Clifford Capital in December 2016, he was with Bank of America Merrill Lynch, covering the Energy, Infrastructure, Power and Utilities sectors for the investment banking division, where he led in origination and execution of capital markets (debt and equity) and M&A transactions for Southeast Asia. He was previously in investment banking with Standard Chartered Bank, covering the Asia mining and metals sector. He holds a Bachelor of Accountancy and Bachelor of Business Management (Summa Cum Laude) from the Singapore Management University.

- Mr. Saumitra Shrivastava is the Head of Loan Acquisitions and oversees the loan acquisitions activities for Bayfront. He has extensive experience in originating and structuring complex project finance transactions across multiple sectors. Prior to joining Bayfront, he was with multilateral organisations and global commercial banks, including the Asian Development Bank, BNP Paribas and Sumitomo Mitsui Banking Corporation. He has financed and advised on projects across various geographies including, Asia Pacific, Central Asia and European and Middle East regions. He holds a Bachelor's and Master's in Economics from University College London, United Kingdom.

- Mr. Richard Desai is the Chief Risk Officer (CRO) of Bayfront, Clifford Capital and the CCH Group. Prior to joining Clifford Capital in November 2012, Richard was an executive director at JP Morgan's credit risk management group in Hong Kong. During his 22-year career at JP Morgan, he covered various areas at the bank with over 12 years within the credit risk management group. He has extensive exposure across multiple industries throughout the Asia Pacific region, with a focus on structured financings, debt restructurings and principal investment. He holds a Bachelor's degree in Economics from the University of California, Berkeley.

7. Understanding Portfolio Analysis – BIC2

Availability-based or fixed price off-take contracts
Project finance loans with lower credit risk tend to benefit from long-term contracts providing predictable and stable revenue from creditworthy counterparties and limited competition.

Approximately 13.0% of the total loan commitment amount in the portfolio involves projects that are exposed to commodity price risk, while the remaining 87.0% of the total loan commitment amount in the portfolio involves projects that are underpinned by robust availability-based or fixed price off-take or charter contracts.

A robust debt service coverage ratio (DSCR) throughout the life of the project debt usually indicates a greater tolerance for occasional variations in operational performance as well as greater economic incentives for the sponsor to provide support. For financing structures where debt is fully amortising and fully repays during the term of the project's off-take agreement, the debt service coverage ratio is a powerful metric

in the assessment of the ability of the project to service its debt obligations. All loans in BIC2's portfolio are fully amortising.

Only 8% of the loans in the portfolio had a DSCR slightly less than 1.25x (recorded in FY2020) but they are mitigated by their investment grade rating profile or presence of ECA cover.

Average 2020 DSCR	Number of loans	Aggregate commitment amount outstanding (US$ million)	Percentage of aggregate commitment amount outstanding in Portfolio
1.00x – <1.25x	3	32.1	8.0%
1.25x – <1.50x	6	119.8	29.9%
1.50x – <1.75x	4	53.0	13.2%
1.75x – <2.00x	–	–	–
2.00x – <2.25x	4	45.8	11.4%
2.25x – <2.50x	–	–	–
2.50x – <2.75x	1	17.0	4.2%
2.75x – <3.00x	–	–	–
> 3.00x	2	33.2	8.3%
Not Available	7	100.3	25.0%

Source: Offering Memorandum

Industry sub-sectors
The projects are diversified across eight industry sub-sectors, of which conventional power and water was the largest at 36.4%. There are no coal fired power plants within the portfolio, as Bayfront has explicitly excluded all coal related projects from its investments under its Sustainable Finance Framework.

43.4% of the portfolio by aggregate commitment amount were eligible sustainable assets which backed the dedicated sustainability tranche.

Sector	Number of loans	Aggregate commitment amount outstanding (US$ million)	Percentage of aggregate commitment amount outstanding in Portfolio
Conventional power and water	8	146.1	36.4%
Renewable energy	9	102.5	25.5%
Integrated LNG	3	52.3	13.0%
Other oil and gas	2	38.0	9.5%
Transportation	1	20.3	5.1%
Midstream	2	20.0	5.0%
Electricity transmission	1	17.0	4.2%
Metals and mining	1	5.0	1.2%

Source: Offering Memorandum

There are no mining projects in the portfolio. The last category mentioned in the table refers to a pre-export facility for metals delivery.

13% of the portfolio are exposed to market risk (LNG price), but these projects are partially mitigated by long-term take-or-pay contracts with multiple buyers. Further, 8.3% have an investment-grade rating profile, while the remaining 4.7% has displayed very high DSCRs. They are also seasoned projects with 4 to 8 years of seasoning.

According to Moody's study, the power sector experienced a higher ultimate recovery of 80–100%. The majority of BIC2's portfolio is in the power sector (conventional power and water + renewable energy), as shown by the table above.

Distribution of defaults and ultimate recoveries by industry

Industry Sector	Average Ultimate Recover Rate (Basel)				
	0%-20%	20%-40%	40%-60%	60%-80%	80%-100%
Chemicals Production					✓
Infrastructure				✓	
Leisure and Recreation				✓	
Manufacturing			✓		
Media and Telecoms				✓	
Metals and Mining				✓	
Oil and Gas				✓	
Other					
Power					✓
Total				✓	

Note: Based on 306 ultimate recoveries (Basel)
Source: Moody's Analytics Data Alliance Project Finance Data Consortium

Ratings Distribution

Credit estimate rating factor distribution of the identified portfolio
Percentage relative to the identified portfolio's par amount

Credit Estimate Rating Factor	% of pool (after notching adjustment)*	% of pool (before notching adjustment)
10-40	16.9%	16.9%
70-180	13.8%	21.3%
260-610	20.3%	20.0%
940-1766	34.3%	41.6%
2220-3490	14.7%	0.2%
Total	**100%**	**100%**

*A two-notch downward adjustment was applied to the largest credit estimates representing 30% of the total portfolio in accordance with the Moody's Approach to Using Credit Estimates in Its Rating Analysis cross-sector rating methodology.
Source: Moody's Investors Service

Refer to Appendix 2 for the mapping of the credit estimate rating factors to Moody's rating scale. As listed above, the majority of the pool is rated investment grade (rating factor of 610 and below) under both measures (pre and post-notching adjustment).

The above Moody's notching adjustment would help to make the IABS structure more conservative and robust.

Geographical project location

According to Moody's study, in the emerging market and developing economies (EMDE) subsets, country risk is the most prevalent cause of default (33.3% for EMDE-A and 38.8% for EMDE-B), followed by market risk. Almost all the defaults attributed to country risk were caused by either (1) currency transfer or convertibility constraints or (2) local currency devaluation.

A significant number of defaults in the EMDE-A and EMDE-B subsets in Latin America and Asia coincided with sovereign crises in Argentina (2001-02), Brazil (1999, 2002),

Indonesia (1997-2002) and Thailand (1997-2000), arising from a systemic banking crisis, currency crisis and/or sovereign debt crisis. While the number of defaults in emerging and developing markets may be low, they tend to cluster around country risk events.

The BIC2 portfolio is very diversified across regions and countries, as shown in the table below. Exposure to sub-investment grade foreign currency country rating stands at around 36.2%, with less than 9% exposure to foreign currency country rating of B2 (of which less than 5% is uncovered).

Country distribution of the identified portfolio
Percentage relative to the identified portfolio's par amount

Country of Project	Foreign Currency Country Ceiling	Foreign Currency Country Rating	% of Identified Pool	Covered Sub-Pool*	Uncovered Sub-Pool*
Australia	Aaa	Aaa	8.3%	0.0%	8.3%
United Arab Emirates	Aaa	Aa2	7.7%	0.0%	7.7%
Qatar	Aa1	Aa3	10.2%	0.0%	10.2%
Kuwait	Aa2	A1	4.8%	0.0%	4.8%
Saudi Arabia	Aa2	A1	7.2%	0.0%	7.2%
Philippines	A2	Baa2	4.4%	3.9%	0.5%
India	A3	Baa3	17.7%	0.0%	17.7%
Indonesia	A3	Baa2	3.5%	3.5%	0.0%
Brazil	Baa2	Ba2	9.5%	0.0%	9.5%
Bangladesh	Ba2	Ba3	10.3%	3.1%	7.2%
Vietnam	Ba2	Ba3	7.5%	5.1%	2.5%
Cambodia	B1	B2	4.2%	4.0%	0.2%
Papua New Guinea	B1	B2	4.7%	0.0%	4.7%
Total			**100.0%**	**19.5%**	**80.5%**

*Covered sub-pool includes the covered portion of loans in the identified portfolio that is covered by external credit provider under certain types of guarantees or insurance policies. Uncovered portion of the covered loans is included in the uncovered sub-pool.
Source: Moody's Investors Service

Distribution of defaults and ultimate recoveries by region

	Basel Definition of Default					Moody's Definition of Default				
Region	Defaults	Average Years to Default (Note 1)	Ultimate Recoveries (Note 2)	Average Ultimate Recovery Rate (Note 2)	Average Years to Emergence (Note 2)	Defaults	Average Years to Default (Note 3)	Ultimate Recoveries (Note 4)	Average Ultimate Recovery Rate (Note 4)	Average Years to Emergence (Note 4)
Africa	26	5.2	8	71.2%	3.1	21	4.5	8	71.2%	2.8
Asia	60	3.6	42	79.2%	3.5	53	3.8	39	77.5%	3.5
Eastern Europe	18	4.5	5	98.3%	1.8	11	4.3	4	97.9%	2.1
Latin America	74	3.1	37	79.7%	2.3	64	3.3	34	80.6%	2.5
Middle East	9	4.4	5	80.0%	4.0	7	3.5	5	80.0%	4.0
North America	187	4.0	100	77.3%	2.2	141	4.0	90	75.6%	2.1
Oceania	29	3.8	16	79.3%	2.1	25	3.8	16	79.3%	2.2
Western Europe	208	5.0	93	80.4%	2.2	117	4.5	65	74.6%	2.3
Total	611	4.2	306	79.1%	2.4	439	4.0	261	76.8%	2.5

Note: 1) based on 611 defaults (Basel), 2) based on 306 ultimate recoveries (Basel), 3) based on 439 defaults (Moody's), 4) based on 261 ultimate recoveries (Moody's)
Source: Moody's Analytics Data Alliance Project Finance Data Consortium

Distribution of defaults and ultimate recoveries by regional subsets: OECD/non-OECD countries and advanced economies/EMDEs

Region	Defaults	Basel Definition of Default Average Years to Default (Note 1)	Ultimate Recoveries (Note 2)	Average Ultimate Recovery Rate (Note 2)	Average Years to Emergence (Note 2)	Defaults	Moody's Definition of Default Average Years to Default (Note 3)	Ultimate Recoveries (Note 4)	Average Ultimate Recovery Rate (Note 4)	Average Years to Emergence (Note 4)
OECD/Non-OECD										
OECD	446	4.4	218	79.3%	2.3	296	4.2	178	76.0%	2.3
NON-OECD	165	3.7	88	78.6%	2.9	143	3.7	83	78.5%	2.9
Advanced Economies/EMDEs										
EEA	222	5.0	98	80.3%	2.3	124	4.5	69	74.5%	2.5
EEA/OECD	450	4.4	219	79.4%	2.3	300	4.2	178	76.0%	2.3
EMDE-A	185	3.6	96	80.3%	3.0	153	3.7	90	80.1%	3.1
EMDE-B	150	3.6	80	79.0%	3.0	131	3.7	76	79.1%	3.0
Total	611	4.2	306	79.1%	2.4	439	4.0	261	76.8%	2.5

Note: 1) based on 611 total defaults (Basel), 2) based on 306 ultimate recoveries (Basel), 3) based on 439 total defaults (Moody's), 4) based on 261 total ultimate recoveries (Moody's). Default counts for the various advanced economies and EMDE subsets overlap (see Exhibit 22), and default counts of each subset will not add up to the total study defaults.
Source: Moody's Analytics Data Alliance Project Finance Data Consortium

Moody's data, as shown above, indicates a broad consistency of average ultimate recovery rates between OECD and non-OECD countries, and between EEA, EEA/OECD countries and EMDE-A and EMDE-B countries. This points to the effectiveness of the structural features that characterise project finance loans and mitigate loss given default (LGD), particularly in emerging market transactions.

Countries of payment risk

Country where ultimate source of payment risk is located	Aggregate commitment amount outstanding (US$ million)	Percentage of aggregate commitment amount outstanding in Portfolio
India	71.0	17.7%
Qatar	41.0	10.2%
Brazil	38.0	9.5%
Australia	33.3	8.3%
United Arab Emirates	30.8	7.7%
Saudi Arabia	29.0	7.2%
Bangladesh	28.9	7.2%
South Korea	23.5	5.9%
Suprasovereign	20.3	5.1%
Kuwait	19.1	4.8%
Papua New Guinea	19.0	4.7%
Cambodia	17.0	4.2%
Denmark	15.6	3.9%
Vietnam	10.0	2.5%
Germany	2.8	0.7%
Philippines	1.9	0.5%

Source: Offering Memorandum

As seen above, BIC2 portfolio is well diversified across many countries where the ultimate source of payment risk is located. Certain countries that were not featured in the earlier table of countries of project location refer to the jurisdictions which are providing ECA or MFI cover to the loans (e.g. South Korea, Suprasovereign, Denmark, Germany).

Credit enhancement support by ECAs and MFIs
77.6% of the portfolio were uncovered loans, while MFIs and ECAs supported 11.8% and 10.6% of the loans respectively.

Loan participations

BIC2 has acquired indirect exposures for about a third of the portfolio of loans via participation agreements with several Aa-rated and single-A-rated banks. Moody's has taken this counterparty risk into their modelling, at the early CDOROM stage.

Close to 70% of the indirect exposures are covered loans. The benefit of the cover is captured by Moody's during their modelling, in terms of a higher recovery rate.

Construction risk

Approximately 83.8% of the total loan commitment amount in the portfolio comprises completed, operational projects. All of the remaining projects under construction benefit from sponsor completion guarantees or sponsor support.

Construction risk	Number of loans	Aggregate commitment amount outstanding (US$ million)	Percentage of aggregate commitment amount outstanding in Portfolio
Completed projects	23	336.2	83.8%
Projects under construction	4	65.0	16.2%

Source: Offering Memorandum

Project *seasoning*

Over 80% of the portfolio is comprised of loans to seasoned projects (2 years or longer), with an average seasoning of 6 years and as high as 13 years, as of BIC2's issue date.

According to Moody's, marginal annual default rates of project finance loans remain consistent with the marginal default rates of high speculative-grade credits in the first three years. However, they trend toward marginal default rates consistent with single-A category corporate ratings by year seven from cohort formation.

Please see the final offering memorandum[4] for more information, including the risks relating to the collateral obligations and the project issuers.

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[4] Available at https://www.bayfront.sg/resources/ck/files/BIC%20II%20-%20Final%20IM%20(11%20June%202021).pdf

8. Understanding Structure Analysis – BIC2

Bayfront Infrastructure Capital II (BIC2) Capital Structure

Class/Tranche	Tranche spreads	Orig Ratings	Notional ($)
A1	LIBOR_6MO + 1.25%	Aaa	176,900,000
A1-SU (sustainability tranche)	LIBOR_6MO + 1.20%	Aaa	120,000,000
B	LIBOR_6MO + 1.85%	Aa1	33,300,000
C	LIBOR_6MO + 2.35%	A3	22,100,000
D	LIBOR_6MO + 3.40%	Baa3	8,800,000
Pref Shares	NA	NR	40,124,154

BIC2's payment waterfall is consistent with that of a typical CLO – it pays the tranches sequentially in both the interest and principal waterfalls (pro-rata among tranche A1 and A1-SU which rank pari passu with each other). Both waterfalls include OC and interest coverage (IC) tests, as shown in the table below.

Test	Ratio at issue date	Trigger	Result	Cushion
Class A/B OC Test	121.5%	116.5%	Pass	5.00%
Class A/B IC Test	NA	110.0%	NA	
Class C OC Test	113.9%	109.4%	Pass	4.50%
Class C IC Test	NA	107.5%	NA	
Class D OC Test	111.1%	107.1%	Pass	4.00%
Class D IC Test	NA	105.0%	NA	

OC tests: OC tests provide additional credit support for the rated tranches. For instance, if the Class D OC ratio is tripped (below 107.1%), the deal will divert interest cash flow (after paying the scheduled interest on Class D tranche) to repay the senior-most outstanding tranche until the breached OC ratio is cured.

- OC ratio is calculated by dividing the adjusted collateral principal amount by the sum of the tranches. For example, the OC ratio at the class D level, calculated on the issue date, would be $401.2 mn/$361.1 mn (sum of class A to class D notional) =111.1%.

- The adjusted collateral principal amount means the aggregate principal balance of the collateral obligations excluding excess Caa and defaulted assets, each at the lower of their respective market values and Moody's recovery amounts[5].

  - Excess Caa assets are those Caa-rated loans whose total notional exceeds 10% of the portfolio principal balance.

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[5] Calculated as the product of the applicable Moody's recovery rate for the type of loan (as set out in Moody's rating methodologies, e.g. ECA and MFI covered loans would have 95% recovery rate) and the principal balance of the collateral obligation.

- Excess Caa or defaulted assets are carried at the lower of their market values and Moody's recovery amounts, which is common practice in a typical CLO.

Reinvestment period

No discretionary trading is allowed during the reinvestment period. The collateral manager is only allowed to replenish collateral under three circumstances: (i) full early prepayment of any collateral obligation, (ii) sale of any collateral obligation, and (iii) cancellation of any undrawn commitments on the collateral obligations. Pursuant to (ii) above, the collateral manager may sell any defaulted assets or credit-impaired assets, subject to the satisfaction of all OC and IC tests, and that the aggregate notional of credit-impaired assets that are sold within any six-month period cannot exceed 15% of the initial total portfolio notional.

The manager could replenish the portfolio with eligible investments during the 3-year reinvestment period, but all newly purchased assets must have a public rating or a credit estimate assigned by Moody's. Every replenishment made is subject to a rating agency confirmation by Moody's that the proposed replenishment will not result in the reduction or withdrawal of the ratings assigned to any of the rated tranches. The manager has to identify a suitable replenishment collateral obligation within 45 business days since the replenishment proceeds were received (through full prepayment, cancellation of undrawn commitments or sale of defaulted or credit-impaired assets, as the case may be).

Post reinvestment period

No reinvestment is allowed post reinvestment period. In other words, all scheduled or non-scheduled proceeds received from the collateral pool after the reinvestment period will be used to pay down the rated tranches sequentially.

Structure Quantitative Analysis

The following section addresses the structure analysis of BIC2 – testing the resilience of its capital structure relative to its collateral portfolio under the various stress scenarios.

In the base case, a cumulative default rate of 7% is used – which is slightly more conservative than the default rate implied by BIC2's adjusted WARF (please see Appendix 2).

The resilience of the IABS structure would be tested under the various stress scenarios including 3 times and 5 times the base case default rate, as well as stressing some of the weaker credits in the portfolio in addition to the base case.

<u>Base case</u>

Assumptions

Prepayment rate	5%
Default rate	1.0% annual default rate for the first 7 years
Recovery rate	75%
Recovery lag	24 months

Replenishment	▪ Same profile in terms of spreads and maturity as the existing portfolio but at 99.5% price ▪ The WAL of reinvested collateral is 5.9 years

The annual default rate of 1% per year (for the first 7 years) translates to around 7% of cumulative default rate. The recovery rate used is 75% which is largely in line with historical observation and Moody's assumption. Prepayment rate assumed is 5% (this refers to the unscheduled prepayment rate), which is fairly in line with BIC's actual prepayment rate. The replenishment assumptions are in line with the existing portfolio metrics.

Under this base case scenario, the equity tranche is seeing an around mid-single-digit IRR, while all the rated tranches are fully repaid without any impairment.

Stress testing scenario one – 3 times the base case default rate and lower recovery rate and longer recovery lag

Assumptions

Prepayment rate	5%
Default rate	3.0% annual default rate for the first 7 years
Recovery rate	70%
Recovery lag	36 months
Replenishment	▪ Same profile in terms of spreads and maturity as the existing portfolio but at 99.5% price ▪ The WAL of reinvested collateral is 5.9 years

All rated tranches are repaid in full without any impairment in this stress scenario one.

Stress testing scenario two – 5 times the base case default rate and lower recovery rate and longer recovery lag

Assumptions

Prepayment rate	5%
Default rate	5.0% annual default rate for the first 7 years
Recovery rate	70%
Recovery lag	36 months
Replenishment	▪ Same profile in terms of spreads and maturity as the existing portfolio but at 99.5% price ▪ The WAL of reinvested collateral is 5.9 years

In this stress scenario two, all rated tranches are repaid in full without any impairment.

Stress testing scenario three – base case + default all sub-investment grade loans with over 3% margin

Assumptions

Prepayment rate	5%
Default rate	1% annual default rate for the first seven years and to default all sub-investment grade loans (current notional of $ 70.8 million) with over 3% margin in month 12
Recovery rate	75%
Recovery lag	24 months
Replenishment	▪ Same profile in terms of spreads and maturity as the existing portfolio but at 99.5% price ▪ The WAL of reinvested collateral is 5.9 years

All rated tranches are repaid in full in this stress scenario three without any impairment.

Stress testing scenario four – base case + default all loans with over 3% margin

Assumptions

Prepayment rate	5%
Default rate	1% annual default rate for the first seven years and to default all loans (current notional of $92 million) with over 3% margin in month 12
Recovery rate	75%
Recovery lag	24 months
Replenishment	▪ Same profile in terms of spreads and maturity as the existing portfolio but at 99.5% price ▪ The WAL of reinvested collateral is 5.9 years

In this stress scenario four, all rated tranches are repaid in full without any impairment.

Finally, the breakeven default rate at the Baa-rated tranche is at around 7.5 times the base case default rate, with 70% recovery rate. Breakeven default rate refers to the maximum default rate the Baa-tranche can withstand and yet achieve a 0% IRR.

Overall, the above stress scenarios highlight that the IABS' capital structure is meant to provide good credit support to all the rated tranches.

9. Conclusion

IABS may be a relatively new securitised product, but one that is backed by an important, large and growing collateral base – infrastructure assets. Despite its size and geographical reach, infrastructure as a sector has long remained out of the reaches of many non-bank institutional investors, due to various barriers to entry. IABS can serve as a valuable solution to address the large infrastructure financing gap in the Asia-Pacific region by mobilising institutional capital into infrastructure debt.

Employing a well-established securitisation methodology utilised by CLOs, coupled with a solid performance track record in terms of default and recovery rates, IABS have a promising future ahead. Given the long-term programme of IABS, in which the manager is looking to be a regular issuer (backed by strong funding), I expect more investors will increasingly become more accustomed to this asset class.

As more series of IABS are issued and the investor base becomes deeper and broader over time, this should also support secondary market liquidity and trading.

The development of this 'new' asset class is ingenious and innovative and I look forward to seeing more such issuances in the future which will further 'open up' the project and infrastructure financing market to institutional investors.

Appendix 1

How does CLO securitisation work?

Have you ever wondered how CLO AAA/AA/A tranche ratings are derived from a portfolio of non-investment grade rated loans?

This section will try to address this question simplistically.

The key to the creation of a solid CLO rating is the waterfall concept or credit subordination. Before we go into the credit subordination concept, let us take a closer look at the portfolio credit risk profile.

Three key factors drive the shape of the portfolio credit loss profile:

- Probability of default (PD) of each loan in the portfolio (driven by its credit rating and tenor)
- Recovery rate (or 1 - LGD)
- Default correlation between loans (driven mainly by country and industry)

Let's assume that the weighted average PD of the portfolio (say 50 credits spread across many industries) is 20% (over 8 years), and its weighted average recovery rate is 50%. Does this mean that if one were to run 10,000 scenarios (based on the Gaussian copula function), most scenarios would show an average portfolio credit loss of 20%*(1-50%) = 10.0%? The answer is no.

Why? This is due to default clusters (as defined by default correlation).

Companies would have a higher default correlation with other companies operating in the same industry than those operating in different sectors. Not all companies in the same declining industry would suffer the same fate, as some might still emerge as winners even when their peers went out of business. As companies are 'real businesses', they would cut costs, restructure and transform themselves when they run into trouble. Maybe this is why the track record of CLO rated tranches (backed by corporate loans) over several credit cycles has been impressive. More importantly, a typical CLO portfolio is well-diversified across regions and industries. What is the chance of seeing default clusters across several industries?

Going back to the shape of the portfolio credit loss curve, one would expect to see a tail risk (low chance of high losses). If we were to assume a 30% intra-industry default correlation and a 5% inter-industry default correlation, we would see the sort of credit risk profile as shown in the table below:

Table 1	Portfolio credit losses
Expected Loss (%)	10.0%
Max	30.0%
Value @ Risk (%)	
5.0%	18.8%
4.0%	19.3%
3.0%	20.0%
2.0%	21.0%
1.0%	22.8%
0.5%	**24.3%**
0.1%	**27.0%**

Source: CLO Research

As shown in table 1, the simplistic modelling result (from only 10,000 scenarios) shows a 0.5% chance (or less) that this portfolio might suffer 24.3% or more credit losses.

Therefore, if a CLO tranche can withstand that huge amount of credit loss, it deserves a solid credit rating. How can this be done?

This is where the waterfall or credit subordination concept comes into play. The AA rated tranche would be supported by lower-rated tranches (single A to BB tranches and excess interest cash flows). Hence, a AA rated tranche is protected and can withstand a considerable amount of portfolio credit loss.
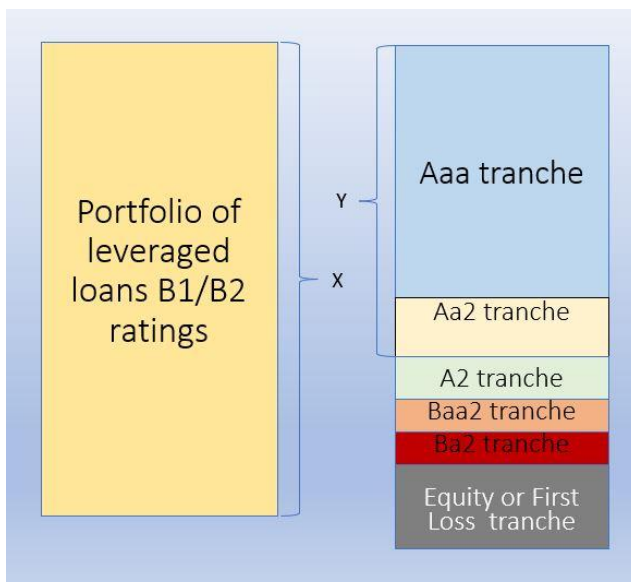
For example, based on the above illustrative diagram, the Aa2 tranche is well covered by the portfolio notional of X. The overcollateralisation ratio at the Aa2 level would be X/Y. Rated tranches could also be protected by additional interest cash flows that have

been diverted (away from the equity tranche or lower-rated tranches) to pay down the Aaa tranche upon the breach of any OC tests.

If a tranche could absorb up to 27% of credit losses under different default timing and interest rate scenarios without defaulting (break-even default rate), this tranche could be rated at the AA level. Table 1 shows a 0.1% chance (or less) that the underlying portfolio could suffer 27% or more credit losses. When comparing 0.1% to the rating agencies' PD benchmark table, we can determine the rating associated with this 0.1% PD – AA rating based on its weighted average life.

Of course, the above illustration is simplistic. The purpose of this article is to show how the CLO technology works – which allows various solid CLO tranche ratings to be created from a portfolio of non-investment loans.

Rating agencies have a highly comprehensive approach to rating CLOs. While Moody's and S&P have their methodologies, the fundamental concept is the same.

For example, Moody's uses the EL calculation to rate a CLO tranche. They typically use the binomial expansion technique to associate asset default scenarios with the likelihood of each scenario (a default distribution). They then use cash flow modelling that relates each assets' default scenario to the cash flows that the rated tranche receives in that scenario. After applying the default distribution to the cash flow model, they calculate the EL for each tranche. Finally, they compare the tranche's EL to the relevant EL benchmark, based on its weighted average life, to determine the rating associated with such an EL.

Section 6 of this research report further elaborates on Moody's rating approach for IABS.

On the other hand, instead of using the EL approach, S&P first assesses the credit portfolio scenario default rate (SDR), which corresponds to the level of defaults that is likely to affect the portfolio in a given rating stress scenario. As a second step, S&P analyses the transaction's cash flows and payment profile. S&P will test the various scenarios, based on key rating drivers to determine the maximum level of defaults that a transaction may sustain while still repaying the noteholders in full and on time. This is the breakeven default rate (BDR). To assign a rating at a given level, S&P looks for the SDR commensurate with that rating to be at or lower than the BDR.

While Moody's uses the EL approach and S&P uses SDR vs. BDR approach, there are two common components involved – portfolio credit risk profile and cash flow modelling on the liabilities.

Appendix 2

Moody's Default Probability Ratings vs. Moody's Rating Factors

Moody's Default Probability Rating	Moody's Rating Factor	Moody's Default Probability Rating	Moody's Rating Factor
Aaa	1	Ba1	940
Aa1	10	Ba2	1350
Aa2	20	Ba3	1766
Aa3	40	B1	2220
A1	70	B2	2720
A2	120	B3	3490
A3	180	Caa1	4770
Baa1	260	Caa2	6500
Baa2	360	Caa3	8070
Baa3	610	Ca, C	10000

Source: Moody's Investors Service

Moody's Idealized Cumulative Expected Default Rates

	Rating factor		Year 1	2	3	4	5	6	7	8	9	10
0	1	Aaa	0.0001%	0.0002%	0.0007%	0.0018%	0.0029%	0.0040%	0.0052%	0.0066%	0.0082%	0.0100%
1	10	Aa1	0.0006%	0.0030%	0.0100%	0.0210%	0.0310%	0.0420%	0.0540%	0.0670%	0.0820%	0.1000%
2	20	Aa2	0.0014%	0.0080%	0.0260%	0.0470%	0.0680%	0.0890%	0.1110%	0.1350%	0.1640%	0.2000%
3	40	Aa3	0.0030%	0.0190%	0.0590%	0.1010%	0.1420%	0.1830%	0.2270%	0.2720%	0.3270%	0.4000%
4	70	A1	0.0058%	0.0370%	0.1170%	0.1890%	0.2610%	0.3300%	0.4060%	0.4800%	0.5730%	0.7000%
5	120	A2	0.0109%	0.0700%	0.2220%	0.3450%	0.4670%	0.5830%	0.7100%	0.8290%	0.9820%	1.2000%
6	180	A3	0.0389%	0.1500%	0.3600%	0.5400%	0.7300%	0.9100%	1.1100%	1.3000%	1.5200%	1.8000%
7	260	Baa1	0.0900%	0.2800%	0.5600%	0.8300%	1.1000%	1.3700%	1.6700%	1.9700%	2.2700%	2.6000%
8	360	Baa2	0.1700%	0.4700%	0.8300%	1.2000%	1.5800%	1.9700%	2.4100%	2.8500%	3.2400%	3.6000%
9	610	Baa3	0.4200%	1.0500%	1.7100%	2.3800%	3.0500%	3.7000%	4.3300%	4.9700%	5.5700%	6.1000%
10	940	Ba1	0.8700%	2.0200%	3.1300%	4.2000%	5.2800%	6.2500%	7.0600%	7.8900%	8.6900%	9.4000%
11	1350	Ba2	1.5600%	3.4700%	5.1800%	6.8000%	8.4100%	9.7700%	10.7000%	11.6600%	12.6500%	13.5000%
12	1766	Ba3	2.8100%	5.5100%	7.8700%	9.7900%	11.8600%	13.4900%	14.6200%	15.7100%	16.7100%	17.6600%
13	2220	B1	4.6800%	8.3800%	11.5800%	13.8500%	16.1200%	17.8900%	19.1300%	20.2300%	21.2400%	22.2000%
14	2720	B2	7.1600%	11.6700%	15.5500%	18.1300%	20.7100%	22.6500%	24.0100%	25.1500%	26.2200%	27.2000%
15	3490	B3	11.6200%	16.6100%	21.0300%	24.0400%	27.0500%	29.2000%	31.0000%	32.5800%	33.7800%	34.9000%
16	4770	Caa1	17.3816%	23.2342%	28.6386%	32.4788%	36.3137%	38.9667%	41.3854%	43.6570%	45.6718%	47.7000%
17	6500	Caa2	26.0000%	32.5000%	39.0000%	43.8800%	48.7500%	52.0000%	55.2500%	58.5000%	61.7500%	65.0000%
18	8070	Caa3	50.9902%	57.0088%	62.4500%	66.2420%	69.8212%	72.1110%	74.3303%	76.4853%	78.5812%	80.7000%
19	10000	Ca	100.0000%	100.0000%	100.0000%	100.0000%	100.0000%	100.0000%	100.0000%	100.0000%	100.0000%	100.0000%
20	10000	C	100.0000%	100.0000%	100.0000%	100.0000%	100.0000%	100.0000%	100.0000%	100.0000%	100.0000%	100.0000%

Appendix 3

Moody's Idealized Cumulative Expected Loss Rates

	Rating factor		Year 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	1	Aaa	0.0000%	0.0001%	0.0004%	0.0010%	0.0016%	0.0022%	0.0029%	0.0036%	0.0045%	0.0055%	0.0067%	0.0079%	0.0093%	0.0107%	0.0122%
1	10	Aa1	0.0003%	0.0017%	0.0055%	0.0116%	0.0171%	0.0231%	0.0297%	0.0369%	0.0451%	0.0550%	0.0719%	0.0876%	0.1051%	0.1241%	0.1449%
2	20	Aa2	0.0007%	0.0044%	0.0143%	0.0259%	0.0374%	0.0490%	0.0611%	0.0743%	0.0902%	0.1100%	0.1371%	0.1674%	0.2009%	0.2376%	0.2776%
3	40	Aa3	0.0017%	0.0105%	0.0325%	0.0556%	0.0781%	0.1007%	0.1249%	0.1496%	0.1799%	0.2200%	0.3540%	0.4199%	0.4909%	0.5668%	0.6473%
4	70	A1	0.0032%	0.0204%	0.0644%	0.1040%	0.1436%	0.1815%	0.2233%	0.2640%	0.3152%	0.3850%	0.5709%	0.6723%	0.7808%	0.8958%	1.0169%
5	120	A2	0.0060%	0.0385%	0.1221%	0.1898%	0.2569%	0.3207%	0.3905%	0.4560%	0.5401%	0.6600%	0.7877%	0.9248%	1.0707%	1.2249%	1.3866%
6	180	A3	0.0214%	0.0825%	0.1980%	0.2970%	0.4015%	0.5005%	0.6105%	0.7150%	0.8360%	0.9900%	1.2826%	1.4738%	1.6732%	1.8799%	2.0929%
7	260	Baa1	0.0495%	0.1540%	0.3080%	0.4565%	0.6050%	0.7535%	0.9185%	1.0835%	1.2485%	1.4300%	1.7773%	2.0226%	2.2755%	2.5347%	2.7991%
8	360	Baa2	0.0935%	0.2585%	0.4565%	0.6600%	0.8690%	1.0835%	1.3255%	1.5675%	1.7820%	1.9800%	2.2719%	2.5714%	2.8778%	3.1895%	3.5052%
9	610	Baa3	0.2310%	0.5775%	0.9405%	1.3090%	1.6775%	2.0350%	2.3815%	2.7335%	3.0635%	3.3550%	4.2333%	4.6683%	5.1006%	5.5286%	5.9513%
10	940	Ba1	0.4785%	1.1110%	1.7215%	2.3100%	2.9040%	3.4375%	3.8830%	4.3395%	4.7795%	5.1700%	6.1940%	6.7647%	7.3228%	7.8671%	8.3966%
11	1350	Ba2	0.8580%	1.9085%	2.8490%	3.7400%	4.6255%	5.3735%	5.8850%	6.4130%	6.9575%	7.4250%	8.1547%	8.8610%	9.5449%	10.2055%	10.8419%
12	1766	Ba3	1.5455%	3.0305%	4.3285%	5.3845%	6.5230%	7.4195%	8.0410%	8.6405%	9.1905%	9.7130%	10.7874%	11.5936%	12.3605%	13.0890%	13.7806%
13	2220	B1	2.5740%	4.6090%	6.3690%	7.6175%	8.8660%	9.8395%	10.5215%	11.1265%	11.6820%	12.2100%	13.4192%	14.3255%	15.1752%	15.9717%	16.7185%
14	2720	B2	3.9380%	6.4185%	8.5525%	9.9715%	11.3905%	12.4575%	13.2055%	13.8325%	14.4210%	14.9600%	16.0511%	17.0573%	17.9899%	18.8544%	19.6564%
15	3490	B3	6.3910%	9.1355%	11.5665%	13.2220%	14.8775%	16.0600%	17.0500%	17.9190%	18.5790%	19.1950%	20.6128%	21.9203%	23.1321%	24.2555%	25.2976%
16	4770	Caa1	9.5599%	12.7788%	15.7512%	17.8634%	19.9726%	21.4317%	22.7620%	24.0113%	25.1195%	26.2350%	27.4851%	28.6344%	29.6671%	30.5988%	31.4428%
17	6500	Caa2	14.3000%	17.8750%	21.4500%	24.1340%	26.8125%	28.6000%	30.3875%	32.1750%	33.9625%	35.7500%	36.6485%	37.4049%	38.0482%	38.6010%	39.0808%
18	8070	Caa3	28.0446%	31.3548%	34.3475%	36.4331%	38.4017%	39.6611%	40.8817%	42.0669%	43.2196%	44.3850%	44.8962%	45.3571%	45.7455%	46.0766%	46.3621%
19	10000	Ca	55.0000%	55.0000%	55.0000%	55.0000%	55.0000%	55.0000%	55.0000%	55.0000%	55.0000%	55.0000%	55.0000%	55.0000%	55.0000%	55.0000%	55.0000%
20	10000	C	100.0000%	100.0000%	100.0000%	100.0000%	100.0000%	100.0000%	100.0000%	100.0000%	100.0000%	100.0000%	100.0000%	100.0000%	100.0000%	100.0000%	100.0000%

Appendix 4

Investor base

BIC2 was 1.4x oversubscribed at the entire book level, with the dedicated sustainability tranche 1.6x oversubscribed. Its investor base has been impressive, with a fairly good spread across investor types and geographies.

Allocation by investor type	By value	By number of investors
Bank treasury	49%	25%
Insurance / pension fund	21%	31%
Asset manager	14%	38%
Multilateral	17%	6%
Total	**100%**	**100%**

Allocation by geography	By value	By number of investors
Asia-Pacific	52%	69%
Europe	20%	19%
Middle East	11%	6%
Supra sovereign	17%	6%
Total	**100%**	**100%**

Source: Bayfront

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