

Fr.gg White Paper

Frigg is a Software as a Service (SaaS) company that liberates sustainable finance by connecting impact investors directly with eco-friendly projects.

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Facilitating a sustainable Future.



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1 Executive Summary

Sustainable infrastructure is the key to reducing greenhouse gas emissions and ultimately fighting climate change. We are falling significantly short of our funding goals for important projects such as renewable energy and adaptation infrastructure. This is caused, at least in part, by shortcomings of the traditional financial system. Current financing mechanisms are too expensive, sluggish, and limited to develop the sustainable infrastructure we need to address climate change.

There are many problems faced by infrastructure developers and investors when operating in a traditional financial system. Unnecessary intermediaries charge excess fees. The costs of publicly listing an asset or transacting on a secondary market are exorbitant. An illiquidity premium discounts the value of key assets. Transparency is poor and the investor base is narrow. Regulations are further tightening all these issues. The culmination of these problems is a high cost of capital and an inefficient system for sustainable infrastructure investment.

From problems come opportunities, however, and the financial system is poised for rebalancing. Decentralized finance can address each of these issues and change the way that we develop and invest in sustainable infrastructure. Tokenization is the blockchain equivalent to an Initial Public Offering and it provides a less expensive and faster option for asset owners to secure financing. Asset-Backed Tokenization is particularly enticing because it allows real assets to be traded instantly on a distributed ledger.

We at Frigg have developed a standard to swiftly trade real assets in a tokenized environment. Our vision is for the Frigg Standard to serve as the golden standard of best practices and workflow onboarding RWAs on-chain, all powered by our software and smart contracts. Switzerland acts as the ideal regulatory environment from which we can launch a secure, decentralized platform. We have developed a Web Application for investors to transact with asset developers and accrue value on-chain. Our device lowers the costs to invest significantly and reduces the cost of capital for sustainable infrastructure developers. We also integrate real-time, asset-level data with blockchain distribution to maximize transparency.

At Frigg, we intend to offer the best platform for issuing and investing in sustainable infrastructure assets. We provide investors with direct access to sustainable infrastructure projects, and we work with reliable infrastructure developers and asset owners to increase their liquidity and reduce their financing costs. We currently have our first proof-of-concept in-sight. The Frigg platform plans to tokenize the debt of a Rwandan hydropower facility so that the project may be re-financed and additional renewable energy projects can be developed. Our team has immense experience in financial systems and sustainable infrastructure. We are excited to help fund the fight against climate change.

2 The Challenges of Financing Sustainable Infrastructure – A Fight Against a Warming Planet

Investments between \$5 trillion and \$7 trillion per year are needed to address the rising demand for sustainable infrastructure and reach the Sustainable Development Goals (SDGs).¹ Based on current trends, however, total funding is expected to fall about \$18 trillion short of that 2040 target.^{2,3}

Without a massive capital reallocation towards renewable energy and climate adaptation infrastructure, we will not have the tools to fight climate change. We at Frigg see this as the modern equivalent to Ragnarok⁴ from Norse mythology. It is the great battle of our time. If history has taught us anything, it is that, collectively, we can conquer anything. At Frigg we aim to play a part in combatting climate change by facilitating the investment of sustainable infrastructure assets.

In this whitepaper, we demonstrate how the current financial system is not effectively meeting sustainable infrastructure investment needs, discuss the opportunity of decentralized finance, and provide our solution to combat this issue. Our platform leverages decentralized finance (DeFi) to invest in projects that fight the battle and accelerate a more sustainable society.

DeFi can transform infrastructure finance by allowing access for a broader spectrum of potential investors with a variety of risk/return thresholds. This allows more efficient price discovery, investment, and trading across the infrastructure lifecycle (i.e., development to mature operation). Smart contracts are programmed to enforce secure compliance protocols and provide access to greater liquidity via 24/7 global markets. Instant transactions and settlements even the playing ground for investors across jurisdictions.

Digital securities provide all the same features and protections of a traditional listed security, with greater security, compliance, and transparency. DeFi provides these functions at a significantly lower cost by leveraging blockchain technology and removing expensive and unnecessary legacy intermediaries.

Frigg is a Software as a Service (SaaS) that transforms how sustainable infrastructure is financed. For project developers, we deliver and maintain software that streamlines fundraising by sourcing capital from DeFi that seeks sustainable yield. Investors in DeFi benefit from direct access, enhanced liquidity, and added transparency for an asset class that has historically been illiquid and inaccessible for most.

The name Frigg comes from the eponymous Goddess that belongs to a race of noble Gods, also known as the race of Æsir in Viking mythology. We compare the similarities between Frigg and Norse mythology as a poetic means to discuss the magnitude of our problem and solution. In line with this theme, our operational team members are given the names of famous Vikings, while our supervisory council members are given the names of Viking Gods. This is a facetious way to demonstrate the importance of each member while paying homage to our company's Scandinavian roots.

¹ (van de Putte et al., 2020)

² See [Can digital securities fund an \\$18 trillion infrastructure gap?](#)

³ Dominated by G20 governments dedicating large stimulus packages (USD 3.2 trillion in 2020). Private markets pales in comparison with USD 156 billion invested in 2020 ([link](#)). Abysmal considering that private investors could drive over two-thirds of the trillions in investment needed to reach net zero.

⁴ **Ragnarok** (noun): the final destruction of the world in the conflict between the Æsir (Viking Gods) and the powers of Hel led by Loki

Together, we aim to further build our community and write history together just like the mythological legends that saved our planet from Ragnarok.

2.1 Climate change remains unresolved, leading to Ragnarok

Climate change is the single greatest risk involving the global environment and economy. Concerns are warranted and creative actions are needed to address the root of the problem.

The World Energy Outlook⁵ predicts several global warming scenarios the world could take.⁶ If countries adhere to their current energy policies, global warming will continue unabated. On this trajectory, there is a 50% chance that the world's mean surface temperature will increase by 2.6°C. Even if countries honor their future-looking climate pledges, fossil-fuel demand will peak in 2025 and the planet's heating will be limited to about 2.1°C. In the most optimistic scenario the world warms by 1.5°C versus pre-industrial levels. It is now incredibly unlikely this will be achieved. Global warming is upon us, and the consequences are significant.

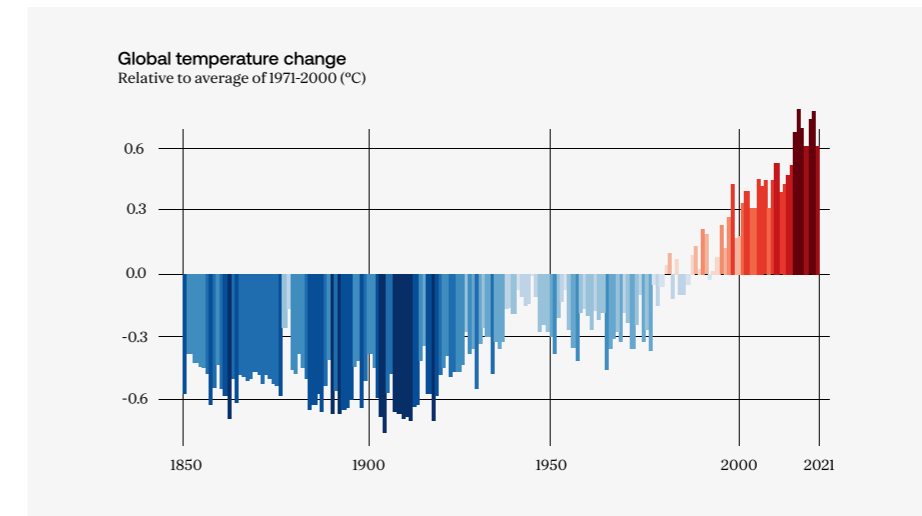


Fig. 01
The emergence of Ragnarok. Stripes represent the world's average temperature. Dark blue are cooler and red ones are hotter than average.⁷

2.2 Traditional finance is failing to invest in scaled sustainable infrastructure

Nearly one-third of the world's population live without reliable access to basic infrastructure such as electricity, drinking water, sanitation, or durable shelter.⁸ In certain regions, matters are getting worse. With inadequate, mismanaged and inherently fragile infrastructure, many areas around the world are unable to sustainably meet existing demands.

Throughout this whitepaper, we demonstrate how the current financial system is not effectively meeting these needs and therefore a significant amount of private capital is misallocated. While private investors have strong demand for sustainable real assets, the infrastructure asset class, is only accessible to a narrow set of investors.⁹ Most retail investors are left out, and the cost to those who rely on this infrastructure is massive.

⁵ See IEA (2021), [World Energy Outlook 2021](#), IEA, Paris

⁶ (van de Putte et al., 2020)

⁷ See [The climate issue](#), The Economist

⁸ See [Millennium Development Goals, targets and indicators, 2015: statistical tables](#)

⁹ (Heeb et al., 2021; Lamech & Saeed, 2003; Regan, 2017; Tian et al., 2021)

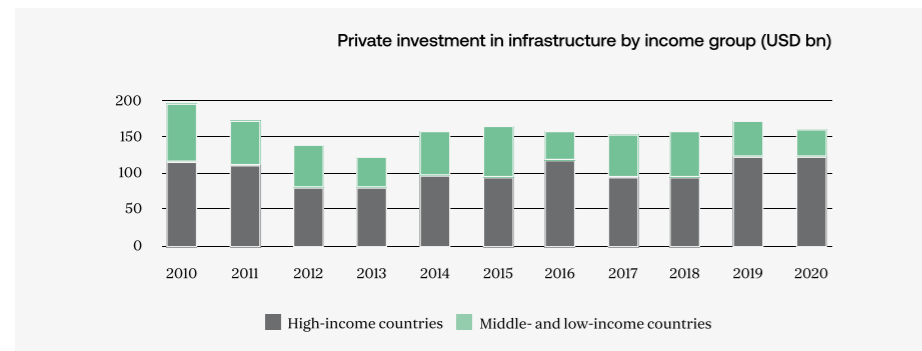
3 Problem: The Constraints of Traditional Finance in Sustainable Infrastructure

The role of the finance industry is to produce, trade and settle financial contracts that can be used to pool funds, share risks, transfer resources, produce information and provide incentives. Emblematic of financial intermediaries is that they introduce friction to business activities in form of time delays, fees, and inaccurate/loss of information.

As finance is vital for the green transition, it is problematic that traditional finance (TradFi) is still plagued with administrative and regulatory burdens, mostly dating back to pre-digital eras, that make it harder and more expensive to mobilize private capital. The current unit cost of financial intermediation therefore excludes many sustainable infrastructure projects from ever being realized and puts us further away from reaching climate goals.¹⁰

Emerging markets are suffering disproportionately, as these countries tend to pay a much higher cost of financing for green energy relative to fossil fuels.¹¹ This creates a “climate investment trap”: as countries with abundant potential for sustainable infrastructure (e.g., renewable energy) must pay a higher price to green their economies and therefore might forego such investments, even if they’re the ones that will suffer the most as the planet warms.

The self-reinforcing feedback loop – high cost of finance, low investment in sustainable infrastructure, worse climate impacts – further drives investors risk premium (see Fig. 02). Private investment in infrastructure projects is therefore not increasing and has remained stagnant for seven years running, and lower than it was 10 years ago (see Fig. 03).



The great irony is that the investment world is bursting with ESG and climate-oriented products. There is so much money chasing “green” assets, yet ESG focused investors are loaded with tech stocks rather than assets dedicated to foster crucial sustainable infrastructure.¹³

To better understand why TradFi fails to mobilize private finance for sustain-

¹⁰ See [Green Finance Isn't Going Where It's Needed](#) (Ameli et al., 2021)
¹² (Global Infrastructure Hub, 2021)
¹³ See [Wall Street Math Shows ESG Funds Can Ride the Value Stock Boom](#)

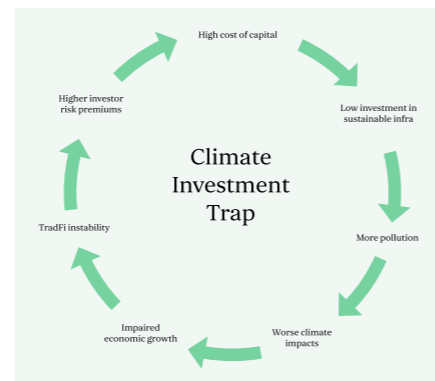


Fig. 02 The global climate investment trap at the macroeconomic level.

Fig. 03 Private investment in infrastructure by income group (USD bn)¹²

able infrastructure, we examine the current system inefficiencies and how they increase the unit cost of financial intermediation.

3.1 Problem 1: Numerous unnecessary intermediaries

Division of current infrastructure asset ownership suggests that private investor funds are managed by multiple layers of financial intermediaries (see Fig. 04). The inclusion of intermediaries is problematic because each additional intermediary adds unnecessary costs, such as transaction- and management fees. The cost of intermediaries impacts the infrastructure assets, as their financial viability gets impaired by a higher cost of capital. The combination of commitment fees, agency commissions, and due diligence costs are responsible for adding nearly 100 basis points to the required return of debt providers. In one study, this amounted to a change from 7.60% to 8.57%.¹⁴ Given that lenders typically cover up to ~70% of the financing costs, a 100bp increase in debt costs affect the equity return significantly. This can ultimately place the financial viability of a sustainable infrastructure project at risk.

3.2 Problem 2: The costs of publicly listing

A way to reduce the number of intermediaries would be to access a broader investor base. Offering asset backed securities for infrastructure assets to investors in TradFi can be established by listing the asset in an Initial Public Offering (IPO). As per the Organization for Economic Co-operation and Development¹⁸, the average underwriting fee for an initial public offering (IPO) with a size of less than USD 100 million can be 9% to 11% in the United States. Hence, publicly listing infrastructure assets is only viable for large infrastructure projects or infrastructure funds that bundle many projects together. Yet, they are still costly and transactions are generally slow, so they are rarely seen.

The cost of going public does vary based on industry and asset type; however, it is a rough indication of the costs associated with accessing liquid public markets. This also partially explains why infrastructure assets are rarely listed. The saved costs from foregoing public investment access are reflected in a higher risk premium by investors; known as the “illiquidity premium”.

3.3 Problem 3: The “illiquidity premium”

Under traditional financial systems, secondary markets for infrastructure assets are rare. In the absence of a functional secondary market, primary investors must add a substantial risk premium to their required rate of return because they cannot easily sell their securities once the investment has been committed.

Traditionally, investment capital can be contractually locked in for up to 20 years.¹⁷ After the capital is locked in, finding an investor to replace the primary investor can take several months, significant effort, and typically cost between \$10,000–20,000 to re-paper the transaction.¹⁸

Research has shown that the illiquidity discount on non-listed securities can be as much as 60% of the deal value.¹⁹ The illiquidity premium is therefore a key driver of the current high cost of capital for these projects, particularly in rural and developing regions where they can provide the greatest marginal benefit.

¹⁴ (Fernandes et al., 2016)
¹⁵ (Walter, 2016)
¹⁶ (OECD, 2017)
¹⁷ (Uzsoki, 2019)
¹⁸ (Stein & An, 2018)
¹⁹ (Longstaff, 1995; Novak, 2016)

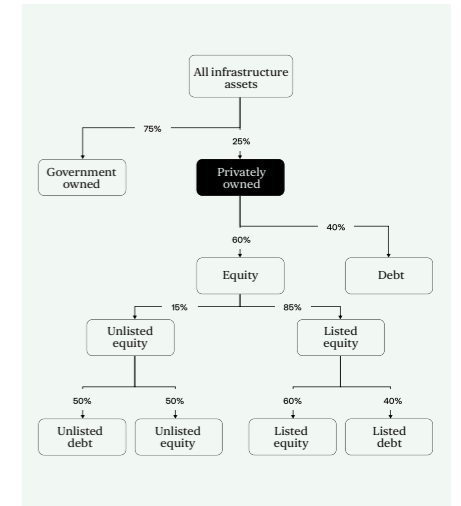


Fig. 04 Infrastructure Participation.¹⁶ Other sources include World Bank, FactSet Research System, RARE calculations, Preqin.

3.4 Problem 4: Costs related to secondary market transactions

Even assets that have been publically listed face obstacles under the traditional finance system. Investors in e.g. Europe pay an average fee of 0.05% per trade value²⁰ for listed public equities, and investors in the United States can trade at no commission if traded on consumer-facing applications e.g., Robinhood and SoFi, for public equities. These applications profit from Payment for Order Flow (PFOF)²¹. PFOF refers to the practice of wholesale market makers paying brokers (typically retail brokers) for their clients' order flow. It means that consumer investors might not necessarily always get the best quoted spot price²².

Further, there is a minimum cap per order, restricting retail investors to purchasing a small number of shares. Lastly, these transaction fees are different from listed infrastructure assets, however, because infrastructure assets have a large front-end cost of going public (15%-20% of the transaction value).²³

For listed infrastructure assets, such as real estate investment trusts for instance, investors must pay the brokerage commission for equity transactions. For larger institutional investors, it can be as low as 0.20% but for retail investors, fees can reach 2% for security purchases and sales.²⁴ These fees are significant and are passed on to developers and asset owners looking to finance their infrastructure.

3.5 Problem 5: A lack of transparency in traditional infrastructure finance

Infrastructure is also notorious for its low standard of transparency. As investors often sit at a distance from the underlying asset, they are often kept in the dark of the operational information flow. We see several issues:

1. Sharing material and accurate information can be costly, bureaucratic, and time consuming.
2. The private sector is not appropriately incentivized to reveal information that is commercially confidential.²⁵
3. It is difficult for key stakeholders, s.a. the utility off-taker, a governmental entity, to oversee and supervise the contract that governs the project.²⁶

The lack of transparency clouds price discovery processes, creates doubt in the benefits of important infrastructure projects, and increases stakeholder risk premium.²⁷

3.6 Problem 6: The challenges of a narrow investor base

In TradFi, the infrastructure asset class is almost exclusively accessible to institutional investors due to high minimum investment sizes, high relative transaction costs, and stringent client suitability requirements.²⁸ The minimum entry requirement is too high, and investments are too illiquid for most retail investors. On the other hand, many projects are too small for minimum institutional investment thresholds due to high internal due diligence costs and sizable investment mandates. Many institutional investors will normally only consider investing in an asset if it is greater than \$50 million in size. Limited access results in the participation from a narrower pool of investors that in turn have greater purchasing power over the assets. The current financial system also incentivizes large infrastructure projects while smaller, more modular assets may be more appropriate for a given community. This creates additional financial friction, particularly for smaller projects where potential remains untapped²⁹, and constrains infrastructure project development.³⁰

20 for trades below \$5 million from [Interactive Brokers](#)

21 An explanation of PFOF on [Andreessen Horowitz](#)

22 From [Barron's](#)

23 ([Uzsoki, 2019](#))

24 ([UBS, 2021](#))

25 ([Reynaers & Grimmelikhuijsen, 2015](#))

26 ([Grimsey & Lewis, 2002](#))

27 ([della Croce & Yermo, 2013](#); [OECD, 2020](#); [Tian et al., 2020](#))

28 ([Uzsoki, 2019](#))

29 even in developed countries where risk premia is significantly lower ([Berntsen & Trutnevyte, 2017](#))

30 ([Schmidt, 2014](#); [Shrimali et al., 2013](#))

3.7 Problem 7: Regulation places pressure on capital providers

Lenders have also scaled back their long-term lending exposures to illiquid infrastructure assets due to regulation and many of the problems discussed above. In the past, lenders would finance up to ~90% of the project construction costs.³¹ It has now spiraled down to about 70%³² in 2014 and nearly 50% in 2021.³³ This indicates that debt providers are less willing to engage in long-term lending and accept projects with moderate leverage. In part, this is explained by regulation and the Bank for International Settlements (BIS) Basel III mandates, the Capital Requirements Directive (CRD IV), as well as tougher annual stress-testing rules in many countries.³⁴ Regulations and market changes have forced lenders to deleverage to reduce loss-bearing capital and increase their balance sheet liquidity.³⁵ This is not entirely a negative outcome; however, its ramifications have had cascading effects on the infrastructure investment space at a time when investment is needed to combat climate change. The decline in leverage has placed pressure on equity capital make up the difference, which has a higher risk premium and a narrower investor base. This increases the WACC and subsequently reduces the number of economically viable projects.³⁶

3.8 The Current State: TradFi bottlenecks leading to unfavorable high costs of capital

These problems continue to compound and result in a lack of an efficient financing for infrastructure assets. Investors require, on average, a 14% equity return and a 6% return on debt (i.e. 8.4% historic Weighted Average Cost of Capital (WACC), assuming a 30:70 equity-debt ratio).^{37/38} This can increase significantly based on jurisdiction, interest rates, asset type, and a multitude of other risk factors.

Attainable access to low-cost capital is a critical step to developing sustainable infrastructure at scale.³⁹ This is one of our greatest challenges to meeting climate goals. If obstacles are left unchecked, climate change will lead to massive and significant impacts several orders of magnitude greater than what we have already seen.⁴⁰

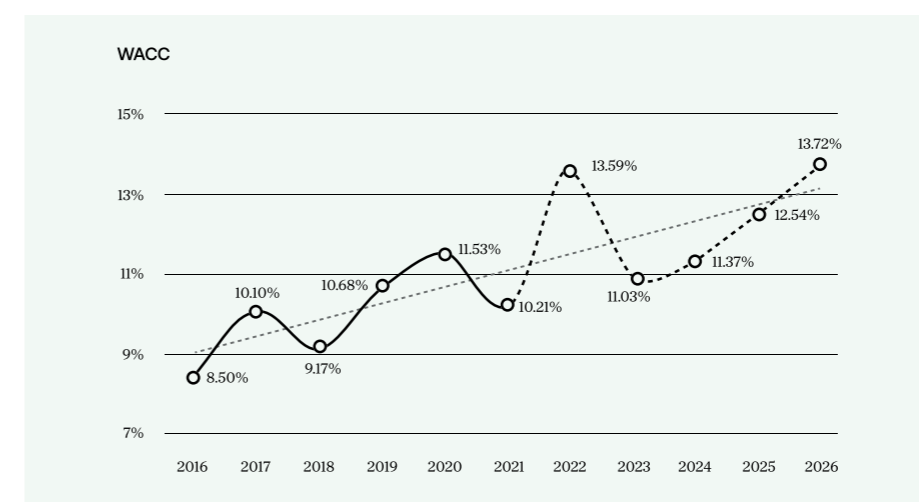


Fig. 05 Previous and projected WACC (emerging markets) according to expert opinion³⁸: Projections based on survey containing a panel of experts (different managers, financiers, and academics, etc.) who are working directly- or indirectly with private infrastructure projects. Energy projects, in particular, showed that the cost of capital has been approximately between 8%–15% from the past five years. A graph has been plotted to display the advices made by the experts, in which solid line shows the WACC of previous five years and dotted one is the forecast for the next five years. Similarly, grey dotted line is presenting the trend line of energy sector.

31 ([Fernandes et al., 2016](#))

32 ([The Economist, 2014](#))

33 ([DWS Group, 2021](#))

34 ([Skandinaviska Enskilda Banken \(SEB\), 2018](#))

35 ([Walter, 2016](#))

36 ([Ehlers, 2014](#)), see also [5 reasons infrastructure projects fail – and what we can do about it](#)

37 ([Halland et al., 2021](#); [IRENA, 2021](#))

38 ([Komor et al., 2020](#))

39 See [Better access to low-cost capital is critical to improve the affordability of clean energy transitions](#)

40 [IPCC, 2022](#)

41 ([Afzal et al., 2022](#))

The emergent effects are already affecting production systems and reducing economic output. This generates political instability and in turn increases the perceived risk of new projects and the cost of capital even further.⁴² The surge in cost of capital as a symptom of the changing climate further exacerbates the current climate investment trap. As evidenced by a recent survey from subject matter experts (Fig. 05), this trend may continue unabated under the TradFi system.

3.9 Conclusion: Conventional financing models are insufficient

We therefore conclude that conventional financing models are insufficient to fund and develop the sustainable infrastructure needed to mitigate and adapt to climate change. Countries with a demand for infrastructure remain in a climate finance trap: a high WACC, significant counter-party risks, information asymmetries, and a substantial liquidity gap. If we are to approach the global sustainable infrastructure requirements to mitigate carbon emissions, financial markets will need to overhaul the approach facilitating ownership and lending.⁴³

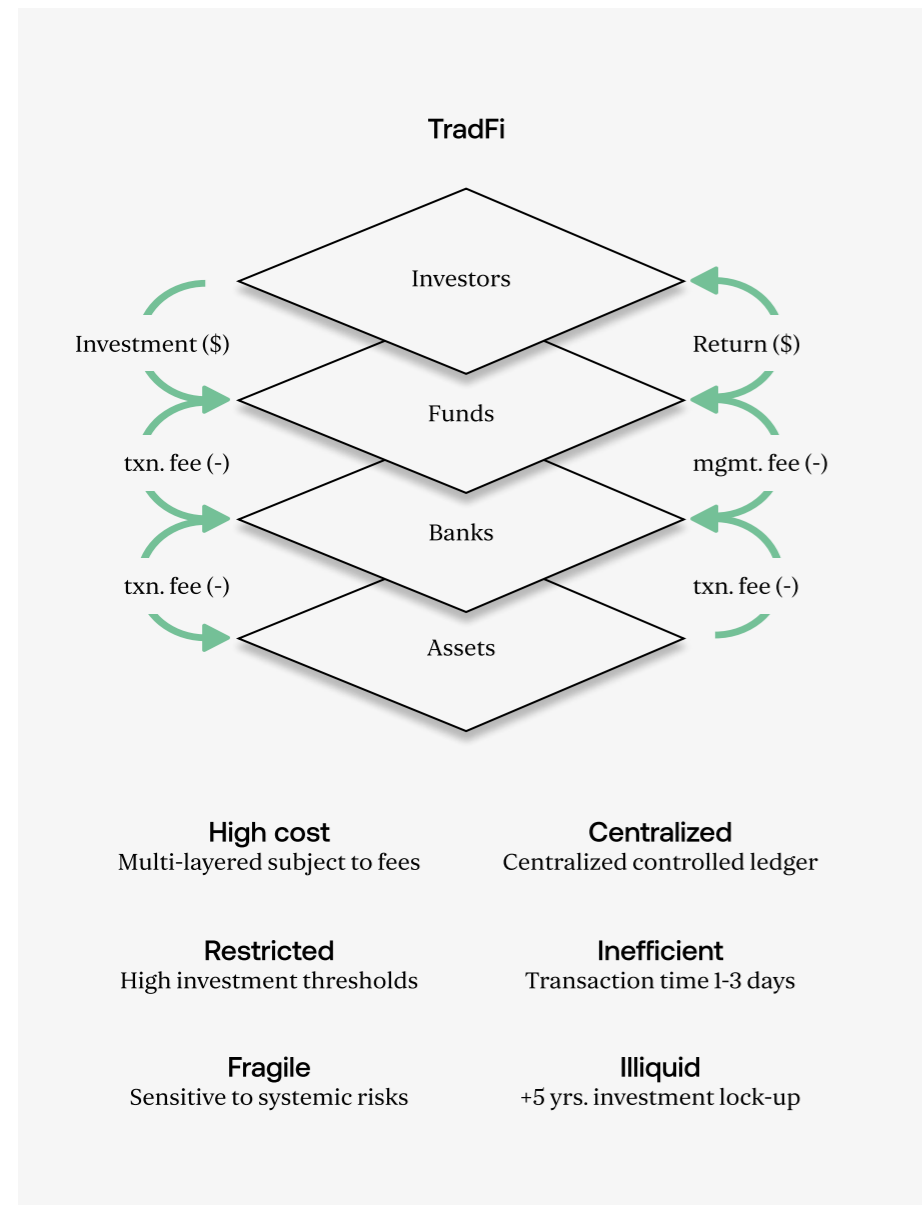


Fig. 06 Problems with TradFi financing models.

42 (Ameli et al., 2021)
43 (Tyson, 2018)

4 Opportunity: DeFi mitigates TradFi bottlenecks

The many limitations of TradFi in financing the future of sustainable infrastructure creates immense opportunity for technology as a solution. If investors were able to transfer all claims, rights, and obligations under an original contract to a third party seamlessly, it would significantly reduce the cost of capital and remove reliance on a financial intermediary. A remarkable opportunity exists for secure and decentralized mechanisms that reduce the friction of securitization. A smoother market reduces costs and improves the flow of information between participants. It equalizes the playing field for all investors and asset owners. In turn, this promotes faster capital recycling and greater transparency. Higher capital efficiency accelerates the development and pipeline of bankable projects as well.

4.1 IPO vs Tokenization

Traditional finance does have some levers for capital efficiency at its disposal, however, they are limited. By undergoing an Initial Public Offering (IPO), TradFi offers a way to address risk diversification or liquidity requirements by investors. This comes at a significant cost relative to the value it provides, however, as numerous financial intermediaries are involved.

Tokenization, a blockchain equivalent to an Initial Public Offering (IPO), offers a cheaper and more secure alternative. The tokens are generated and represented by lines of code stored on a blockchain-based system, where investors can buy and sell tokens instantaneously.⁴⁴ Tokenization removes the need for unnecessary re-papering and listing costs that is currently charged under TradFi. Fig. 07 compares the average costs of establishing a public offering with a TradFi and DeFi approach taken as a percentage of the deal value.

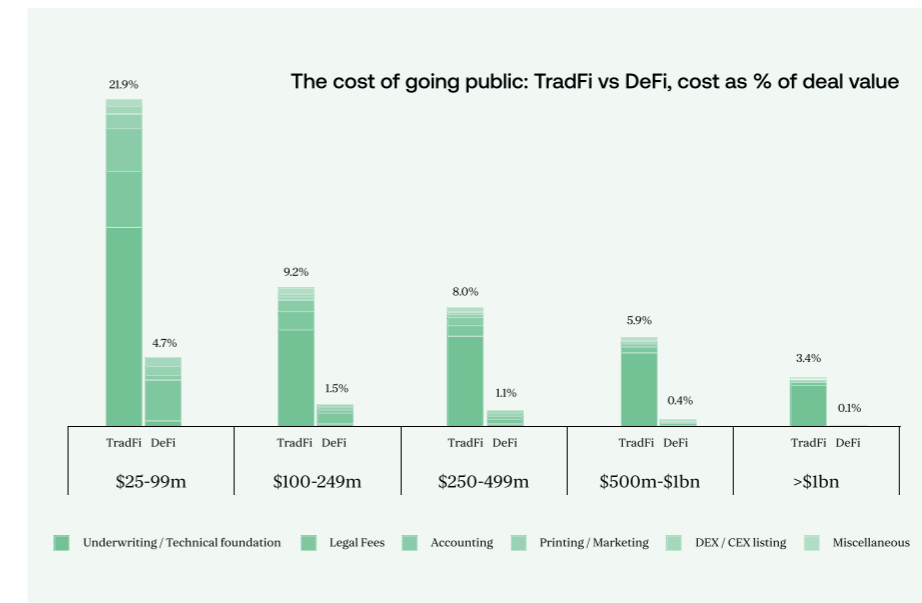


Fig. 07 Figure 7 The Issuer's cost of going public: TradFi vs DeFi, cost as % of deal value.⁴⁷

44 All claims, rights, and obligations under the original contract can automatically be transferred to a third party without the involvement of the token issuer.
45 Sources: PwC, Statista, (UBS, 2021; Uzsoki, 2019), and internet search

4.2 Decentralized Finance as a Solution

Decentralized Finance (DeFi) is an ecosystem of financial applications built on top of distributed public ledgers. DeFi enables decentralized and permissionless financial services. Asset Backed Tokenization (ABT) refers to a specific financial application that allows the trading of assets on a distributed ledger. The main difference is that the marketplace is almost entirely decentralized: there are no banks, brokers, or insurers; only open-source software connected to a blockchain. The secure and rapid nature of DeFi eliminates bank- and other intermediary fees, reduced transaction costs, and improves equal access to information. The Total Value Locked (TVL) in DeFi has increased 900% from under \$10 billion in 2020 to nearly \$100 billion in 2022.⁴⁶

For digital securities traded on Ethereum mainnet, each standard token transfer cost depends on the computing energy required to process and validate transactions on the blockchain. They are referred to as "Gas Price" (Gwei). Historically, on Ethereum (ETH), the largest blockchain that supports smart contracts, the gas prices have ranged between 10 - 542 Gwei⁴⁷, with a current average of 40 Gwei⁴⁸. This is equivalent to USD 16 per trade. There is a tremendous effort into lowering gas price. On certain applications e.g., Arbitrum and Polygon, users can enjoy near-instant settlement with as low as USD 0.01 per trade. Most importantly, the cost does not scale with transaction value. Transaction costs for transactions with larger asset values are negligible. This is most advantageous for institutional investors: for a transaction as large as \$10M, they might only pay \$1 in Gwei.

Tokens that are listed on Centralized Blockchain Exchanges (CEX) do carry higher transaction costs. These exchanges have access to larger pool of investors and often directly link to fiat on-ramp, meaning that investors can convert their fiat currency into cryptocurrencies with these exchanges. Hence, CEXs charge an investor transaction fee for this access. Exchanges like Binance, Bitpanda, Kraken, Coinbase typically charge a 0.25% transaction fee. Compared with the traditional financial system, token exchange fees are higher but are associated with significantly lower upfront fees as seen in Fig. 07.

4.3 The Potential Challenges of DeFi

As with any new technology, there are frictions to adoption. Three premiums are included by investors that account for the risks associated with DeFi assets. A risk premium is included to account for the absence of a bank that will process cryptocurrency transactions. A fiat on/off-ramp premium adjusts for the difficulty in finding banks or financial institutions that allow for the conversion of large blocks of cryptocurrencies to fiat money. A regulatory premium is placed on the uncertainty inherent in cryptocurrency transactions due to nascent government regulation.

Despite these risks, Asset-backed Tokenization (ABT) solves many of the current infrastructure finance limitations and adds value to each stakeholder within the value chain.⁴⁹ This trailblazing technology has the capacity to reduce issuing costs, transaction fees, and it can increase access to capital markets for underserved asset classes. The benefits far outweigh the costs.

In 2021 alone, several leading financial service institutions took big steps to participating in the cryptocurrency asset-class:

- Goldman Sachs relaunched its trading desk for digital assets and aims to offer a "full spectrum" of investments across the emerging asset class to its wealth management clients.⁵⁰
- BlackRock, the world's largest asset manager with \$9 trillion in assets under management, disclosed they have been trading digital asset related products

⁴⁶ From [DeFi Pulse and Goldman Sachs Research](#)

⁴⁷ See [Ethereum Average Gas Price](#)

⁴⁸ From [Etherscan's Gas Tracker](#)

⁴⁹ 'Tokens' hereby refer to security tokens that represent claims on issuers' cashflows. These should be distinguished from platform-specific tokens whose values are unbacked and fluctuate with the supply and demand dynamics native to the hosting platforms (Cong et al., 2021).

⁵⁰ See [Goldman Sachs revives cryptocurrency desk to cash in on bitcoin hype](#) and [Goldman Sachs Bitcoin Investment Offering Coming in Q2: Report](#)

for months.⁵¹

- the European Investment Bank, the investment arm of the European Union, issued its first ever digital bond, worth €100 million, on public blockchain.⁵²
- Bain Capital, the investment firm with around \$155 billion in assets under management, announced a \$560 million fund focused exclusively on the crypto ecosystem.⁵³
- Investcorp, The Middle East's largest alternative asset manager, has launched a dedicated institutional blockchain fund.⁵⁴

More specifically, institutions have already participated in ABT:

- Saluda Grade Asset Management refinanced \$300 million of Home Equity Line of Credit securitization on Provenance blockchain.⁵⁵
- Societe Generale, France's third-largest bank, proposed to borrow \$20 million in cryptocurrency from MakerDAO, one of the largest DeFi protocols.⁵⁶

Financial institutions are looking to enter DeFi to defend their position as a financial intermediary between investors and assets.

Frigg aims to offer investors an alternative: starting with offering investors direct access to sustainable infrastructure assets. Read on to learn more about how Frigg brings DeFi liquidity to promote sustainable infrastructure development.

5 Solution: Frigg bridges DeFi liquidity to Green RWAs

5.1 The flywheel of Asset-Backed Tokenization (ABT)

Asset issuers face several challenges in accessing capital markets through an IPO or other mechanisms in TradFi. The WACC is high, financing is slow, and fee-seeking intermediaries are plenty. When transaction costs are high, project developers inevitably restrict themselves to a tighter range of viable projects. This is more than a market inefficiency problem. As fewer sustainable energy infrastructure projects are built, society departs from its pursuit of achieving clean energy goals.

Investors are affected by the same limitations as issuers in TradFi as the costs and frictions are passed on to all parties. There is rising demand from investors for additional exposure to climate-oriented and sustainable assets. Despite the demand, high investment thresholds, costly transaction costs, and unfriendly regulations remain hindrances in TradFi. In particular, the \$100 billion of capital locked in DeFi are chasing uncorrelated returns from financial markets in the form of real-world assets (RWAs). Capital is abundant, but the supply of high-quality blue-chip RWAs is scarce.

With the Initial Coin Offering (ICO) bubble in 2017 came a wave of RWA tokenization. Many were attempts to blindly tokenize RWAs for the sake of tokenization. Many were distressed or low-quality assets. They started with the wrong beachhead market: they tokenized equity ownership, the most difficult off-chain asset to bring on-chain. Equity-holders are subordinate investors, meaning they have the last claim on assets after all liabilities are paid. In the case of default, on-chain equity-holders are entitled to seize off-chain collateral. This approach requires an off-chain arbitra-

⁵¹ See [BlackRock, World's Biggest Asset Manager, Has Been Stealthily Trading Bitcoin](#)

⁵² See [Bonds on the blockchain](#)

⁵³ See [Introducing Bain Capital Crypto](#)

⁵⁴ See [Investcorp launches the first global institutional blockchain fund from Abu Dhabi](#)

⁵⁵ See [Securitization on Provenance: Saluda Grade Whitepaper](#)

⁵⁶ See [SocGen Wants To Borrow 20M Dai on MakerDAO Using Tokenized Bonds as Collateral](#)

tion process if the assets were to default, introducing a significant obstacle into the tokenization process. In addition, many RWAs with sub-par asset profiles were arbitrarily tokenized and sold to retail investors. Investors were excited by the concept but were unaware of the inherent risks. They became an exit liquidity mechanism for token issuers. We believe that issuers should have skin in the game to incentivize high quality assets and protocols. Issuers should retain a majority of equity and ensure the operational standards of RWAs are industry leading.

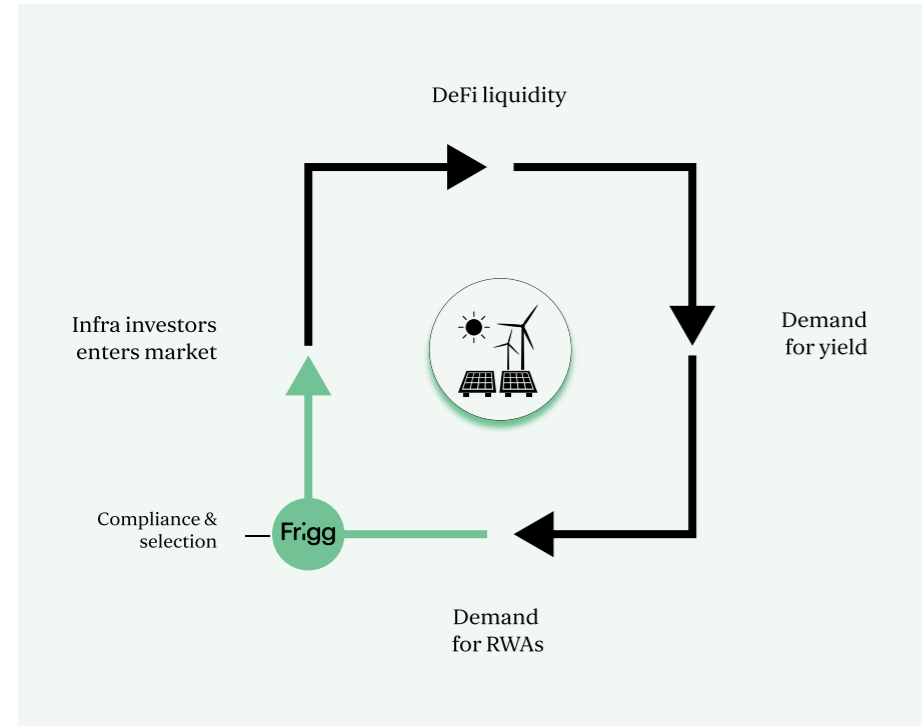


Fig. 08
The Frigg flywheel of
Asset-Backed Tokenization (ABT).

5.2 The Frigg Standard

We thoroughly scrutinized the value proposition of DeFi from first principles. We then compared DeFi against areas of TradFi where capital providers and receivers are deeply underserved. We are now arriving at our ideal wedge, our foot in the door where DeFi can overtake market share from TradFi: Senior tranche of operational mid-market sustainable infrastructure assets.

J.P. Morgan invented the commercial bond, financing the industrialization of the United States with railroads and factories. Goldman Sachs set a new standard for the Discount Cash Flow (DCF) valuation model by using it for the first Initial Public Offering (IPO) in history.⁵⁷ Similarly, Frigg intends to set the Frigg standard for Asset-Backed Tokens (ABT).

In the current market environment, capital is relatively abundant. RWA projects are also abundant. Robust standards to facilitate the two, however, are scarce. Frigg works with institutions, issuers, and investors to bridge liquidity and blue-chip assets between TradFi and DeFi. The first step is tokenizing the debt of sustainable infrastructure projects.

Our vision is for the Frigg Standard to serve as the golden standard of best practices and workflow onboarding RWAs on-chain, all powered by our software and smart contracts.

57 See [Firm's First IPO Uses New Earnings-Based Approach to Valuation](#)

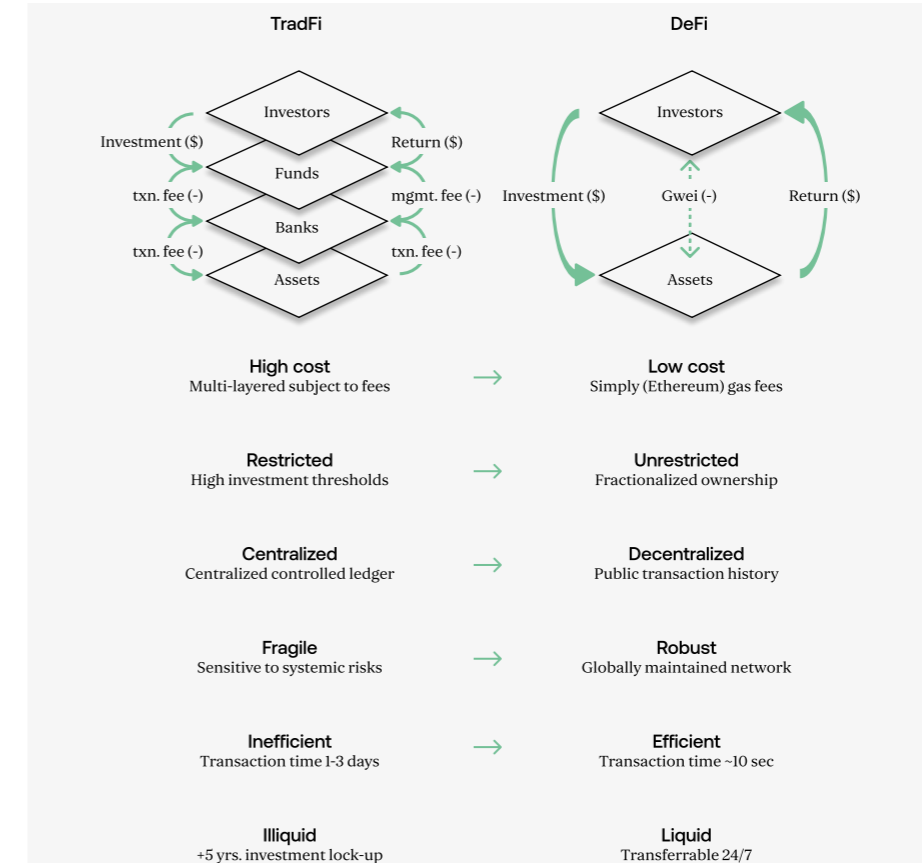


Fig. 09
Value proposition of DeFi from first principles.

5.3 The Swiss Opportunity: Friendly Regulatory Environment

Regulatory impediments hinder the development of Asset-Backed Tokenization in many jurisdictions. In any financial offering there are potential risks to investors that are ideally addressed by careful and balanced regulation.^{58,59} Switzerland has noticed the benefits of DeFi, particularly for underserved retail investors and have swiftly acted to facilitate an environment where it is securely accessible.

Frigg is a Swiss domiciled company. We seize the Swiss opportunity and leverage the country's friendly regulatory environment to offer an efficient, value-augmenting product with low regulatory risk. The overarching goal of the Swiss Federal Council is to shape the Swiss financial sector such that it effectively contributes to the UN Sustainable Development Goals (SDGs). In 2021, The Green Fintech Network further substantiated Switzerland's financial policy framework.⁶⁰ They proposed 16 initiatives to promote sustainable development using innovative technologies. DeFi and Security Token Offerings (STOs) fall firmly within this framework.⁶¹ Specifically, initiative no. 6 focuses on accelerating the deployment of digital platforms that leverage the Swiss bill on Distributed Ledger Technology (DLT)^{62,63}. It aims to strengthen Switzerland's position as a global hub for blockchain powered financing solutions supporting sustainable assets.⁶⁴ Undoubtedly, Switzerland is one of the most attractive and tech-friendly locations for crypto-native companies in climate finance.

58 See [Crypto regulation is coming](#)

59 See [Cryptocurrency Regulations Around The World](#)

60 The Swiss State Secretariat for International Finance (SIF) acts as the secretariat (The Green Fintech Network, 2021)

62 See [Federal Council brings DLT Act fully into force and issues ordinance](#)

63 See [Die Bewilligung als DLT-Handelssystem erlaubt den multilateralen Handel von DLT-Effekten und ist im Finanzmarktinfrastrukturgesetz geregelt](#)

64 See [Switzerland is one of the leading locations in the area of distributed ledger technology \(DLT\) and blockchain](#)

5.4 Portfolio, Globe, and Microsite (PGM)

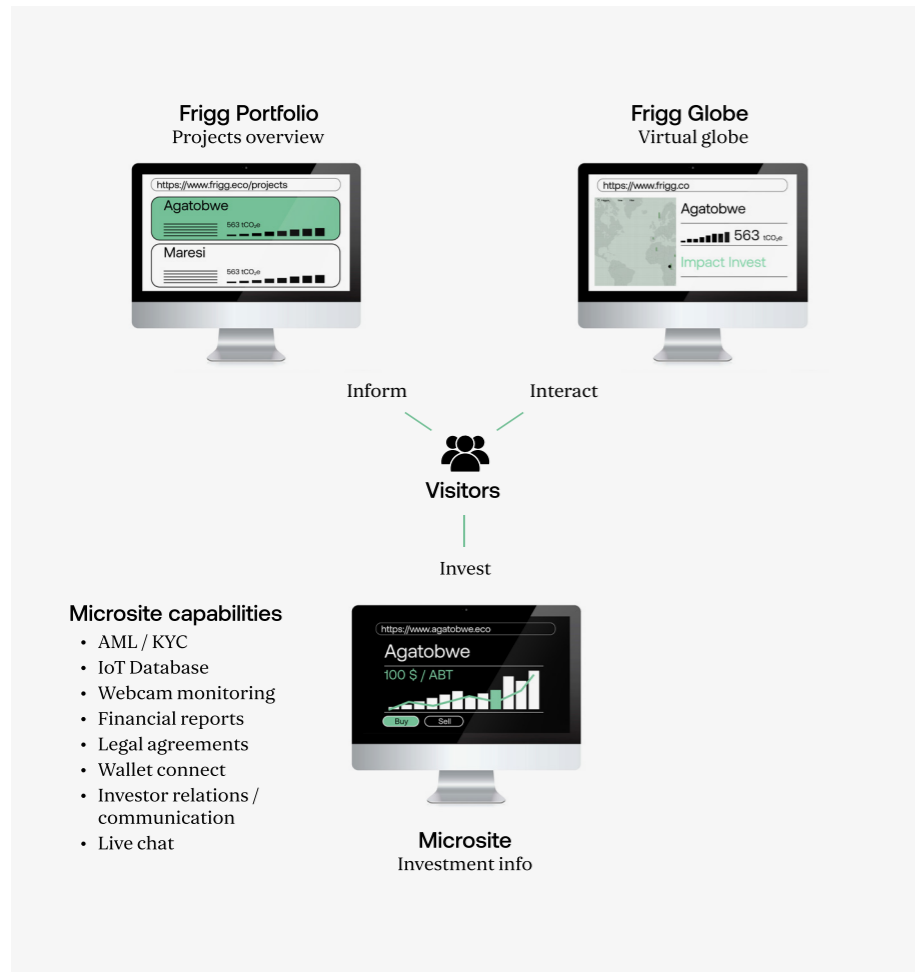


Fig. 10
The Frigg trinity: Universe, Globe, and Microsite (UGM).

Our solution is a Software-as-a-Service (SaaS) platform that allows sustainable infrastructure developers to refinance and attain liquidity for their operational assets. This enables project developers to recycle their available investment capital and re-invest in new projects more efficiently. The debt tokens are backed by operational assets that the developer wishes to refinance. To ensure alignment, developers retain a majority equity holding. They have skin in the game, which acts as a protection for investors.

Investors are given democratized access to a portfolio of highly attractive renewable energy assets. This comes through a web app (The “Microsite”), that is developed, and maintained by Frigg. It is made publicly available to the broader investment community via the Issuer’s web address. We charge Issuers a small annual service fee as a percentage of total proceeds which can be paid in-kind (via ABT) and/or in cash. Like the asset developers, we have skin in the game to share risks with Issuers and Investors.

The target investor base includes retail and institutional investors as well as DeFi protocols with a high Total Value Locked (TVL).⁶⁵ DeFi-native protocols such as MakerDAO and Aave are actively looking for ways to invest in Real World Assets (RWAs) and can use the Frigg standard to facilitate their investments.

Investors access the Microsites of Issuers in three different ways: (1) via Frigg’s Universe, (2) via Frigg’s Virtual Globe, or (3) directly via the Issuer’s Microsite web domain.

⁶⁵ Disclaimer: we do not work with US domicile investors/corporations. Frigg does not advertise any Security Token sale.



Fig. 11 - The Universe is the homepage of Frigg, providing an overview of the different assets available and the Issuers that we work with.

Fig. 11
Frigg Universe

Fig. 12 - The Globe is a “Google Earth” style satellite imagery perspective of issuer assets and each asset’s relevant sustainability metric. It presents investors with near real-time data about the assets (e.g., produced electricity, carbon avoidance, carbon offset).

Fig. 12
Frigg Globe

Fig. 13 - The Microsite is the issuer’s domain. It offers:

Fig. 13
Frigg Microsite

- Detailed information about an operational infrastructure project
 - financial reports, and legal documents (eg. Registration- and Token Holder Agreement)
 - operational performance data (eg. produced electricity and emissions avoided) that can be used by investors to calculate (real-time) asset revenue
- A platform to buy and sell Asset-backed Tokens with accepted stablecoin pairs in a liquid secondary market supported by a decentralized exchange
- Governance framework (Investor registration/authentication, Know-Your-Customer (KYC) / Anti-Money-Laundering (AML))

5.5 The Frigg Process

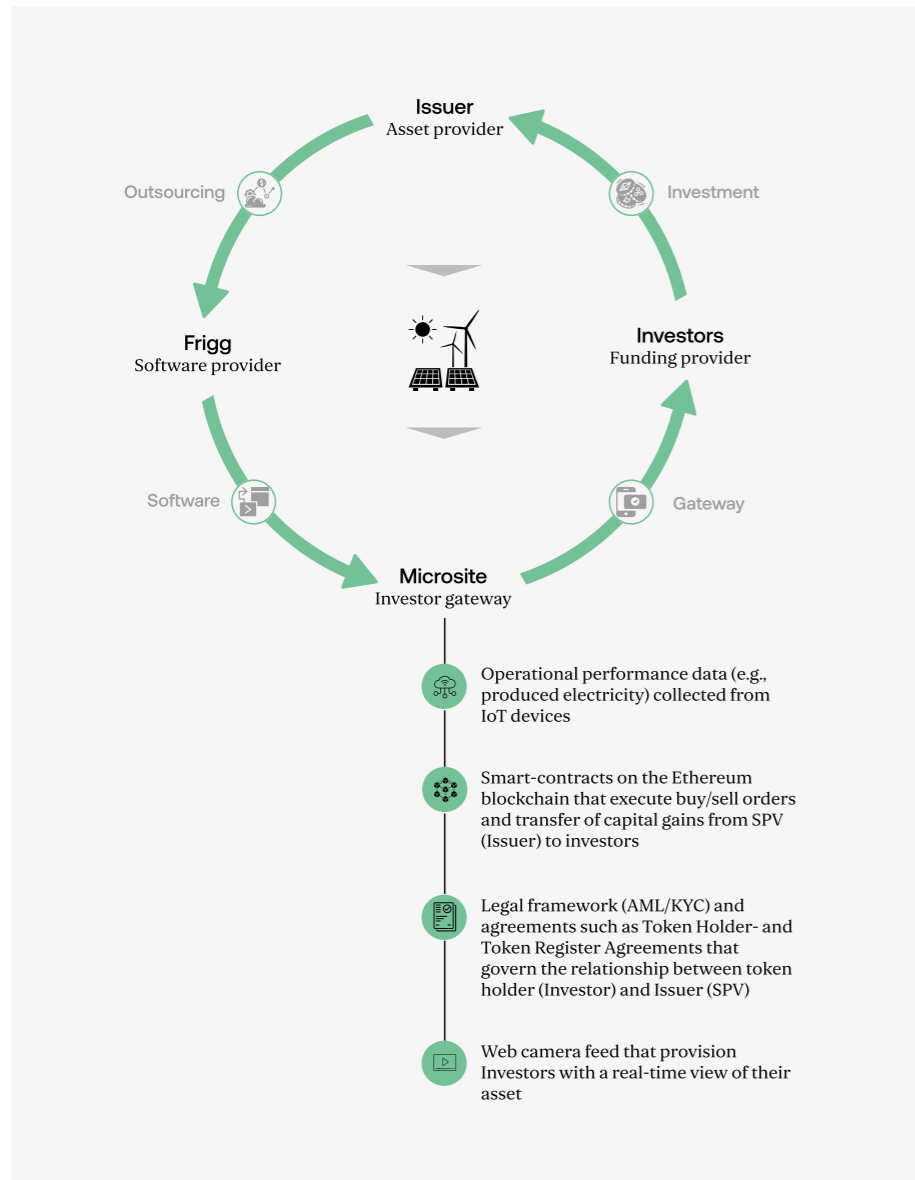


Fig. 14
Frigg Ecosystem of Software,
Issuers, and Investors

The ideal transparency standard should significantly reduce Investor risk premiums and lower the Issuer's cost of capital. This standard should bring Investors and Issuers together to establish trust and streamline workflow, achieving what was not achieved in the 2017 ICO boom.

We propose a standard that offers full transparency to all stakeholders. Our protocol integrates real-time data from IoT devices that are installed to assets. These feed real-time project statistics with smart contracts that govern the ABTs. The ABTs can be traded with a standardized legal framework that complies with the highest legal requirements to ensure the market remains functioning and liquid. This allows for a more efficient price discovery process as Investors can more accurately assess the historic and projected revenues of each asset.

Under traditional models, the data is normally provisioned in an aggregate and unverifiable form behind the veils of annual reports. Tracking real-time operational data also helps to improve asset performance because operators can identify problems early and adjust early. The establishment of an efficient secondary market further substantiates efficient price discovery.

We have designed a series of simple workflow steps that allow for each stakeholder (the Investor, Frigg, and Issuer) to participate in the process in a streamlined and simple manner. Here are the steps:

For Investors

1. Obtain an administrative Anti-Money Laundering / Know Your Client (AML/KYC) 'passport' that is usable throughout DeFi
2. Conduct necessary due diligence of available data and documents to compare in recognition of own personal risk-return profile

Frigg's Processes

1. Review Issuer project documents and ensure certification as being true and complete:
 - Land Lease
 - Land title to the Project Site comprising the emphyteutic lease certificate, emphyteutic lease contract and extract of the cadastral plan;
 - Power Purchase Agreement;
 - Concession Agreement;
 - EPC Contract; and
 - [any others].
2. Assess the financial viability of the proposed tokenized debt security, i.e., ensure that
 - The Debt-to-Equity Ratio is no more than 80:20;
 - The Debt Service Cover Ratio is at least 1.3:1;
 - The Current Debt Service Cover Ratio is at least 1.2:1
3. Establish a legal framework including:
 - Terms of Issue
 - Registration Agreement
 - Double taxation framework (domicile of SPV vs Switzerland)
 - Adjust Articles of Association (for equity tokens)
4. Integrate frigg smart contracts with:
 - Create a multi-signature escrow account
 - Deploy tokenization contracts (ERC-20, or any other relevant standards) on mainnet
 - Set up fiat off-ramp for Issuers
5. Integrate token data on Microsite dashboard
 - Frigg to install relevant APIs that records information on instantaneous token price and token trade volume
6. Set up the on-site IoT data pipeline (Section 5.6)
 - Frigg to install relevant APIs that track, store, and publish operational performance relevant data
7. Microsite establishment and transfer
 - Buy web domain reflecting the name of the Issuer SPV (e.g., agatobwe.eco)
 - Aggregate all relevant APIs (token- and IoT APIs) as well as all required documentation (financial statements, insurances, guarantees, contracts, etc.) provided by the Issuer
 - Transfer Microsoft tenancy and ownership of Microsite to the Issuer
 - Frigg to deliver operations and maintenance to Microsite post ownership transfer
8. Frigg and Issuer to do public marketing of Microsite

Requirements for Issuers

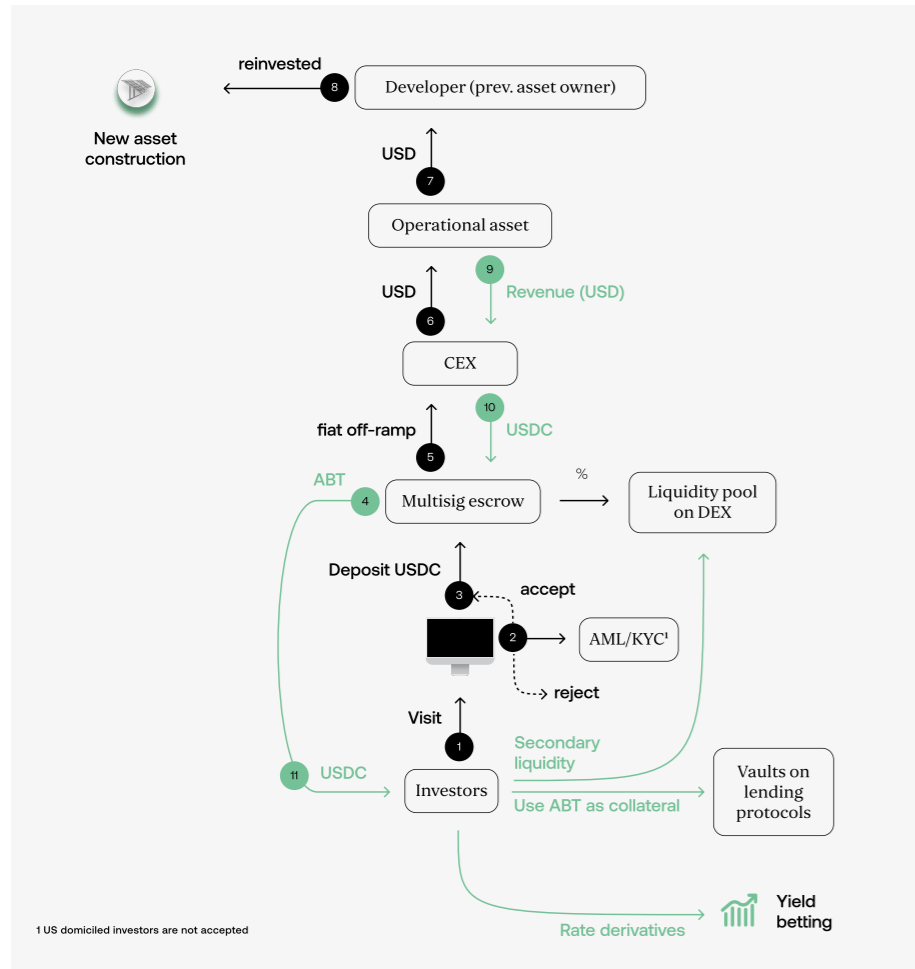
1. **Requirements as to financial statements**
 - Latest audited financial statement, and, as soon as they are available, but in any event within 180 days after the end of each financial year, financial statements for each following financial year.
 - The Issuer shall ensure that each of the financial statements is audited by its auditors.
 - Each set of financial statements shall be certified by a director of the Issuer as fairly presenting its financial condition as at the date.
 - Each set of financial statements should include a balance sheet, income statement, and cash flow statement and is prepared using applicable standards; IFRS, GAAP, etc.
2. **Ensure that financial ratios of the proposed tokenized (debt) capital at the end of each financial year, and calculated based on the financial statement**
 - The Debt-to-Equity Ratio is no more than 80:20;
 - The Debt Service Cover Ratio is at least 1.3:1;
 - The Current Debt Service Cover Ratio is at least 1.2:1
3. **Requirements to financial indebtedness**
 - The Issuer shall not incur or permit to be outstanding any financial indebtedness without the prior consent of the Investors
 - The Issuer shall promptly inform all Investors as soon as it enters any new authorized financial indebtedness
 - The Issuer shall submit for the prior approval of the Investors any change in the budgeted operational costs and
4. **Merger**
 - The Issuer shall not enter into any amalgamation, demerger, merger, or corporate reconstruction without the prior consent of the Investors
5. **Change of business**
 - The Issuer shall procure that no substantial change is made to the general nature of its business from that carried on at the date of token issuance
6. **Acquisitions**
 - The Issuer may not make any acquisition or investment other than as relevant to promote the nature of its business
7. **Shares, dividends, and share redemption**
 - The Issuer shall ensure and procure that none of its shareholders shall reduce its shareholding in the Issuer SPV without prior consent of the Investors.
 - The Issuer agrees to retain ownership (skin in the game)
8. **Taxes**
 - The Issuer must pay all taxes due and payable by it prior to the accrual of any fine or penalty for late payment; ensure that adequate reserves are being maintained
9. **Anti-corruption law**
 - The Issuer shall not directly or indirectly use the proceeds provided by the Investors for any purpose which would breach any Anti-Corruption Law
10. **Compliance with Sanctions**
 - The Issuer sufficient to ensure compliance with any sanctions
11. **Environmental and social matters**
 - Issuer must comply, and ensure compliance, with all Environmental and Social Requirements applicable to the SPV
12. **Maintenance**
 - The Issuer must ensure that all buildings, plant, machinery, fixtures, and fittings at the project site are in, and maintained in:
 - Good and substantial repair and condition and, as appropriate, in good working order; and
 - Such repair, condition and, as appropriate good working order as to enable

them to be let in accordance with all applicable laws.

13. **Insurances**
 - The Issuer must always ensure that, from the date of the token issuance, insurances are maintained in full force and effect, which:
 - insure the plant and machinery on the Project Site (including fixtures and improvements) for their full replacement value (being the total cost of entirely rebuilding, reinstating or replacing the relevant asset if it is completely destroyed, together with all related fees and demolition costs);
 - provide cover against loss or damage by fire, storm, tempest, flood, earthquake, lightning, explosion, impact, aircraft and other aerial devices and articles dropped from them, riot, civil commotion and malicious damage, bursting or overflowing of water tanks, apparatus or pipes and all other normally insurable risks of loss or damage for a project of the type of the Project;
 - provide for contractor's all risk insurance covering contractors and sub-contractors in respect of the Project;
 - provide for professional indemnity insurance covering contractors, sub-contractors and consultants with a design responsibility and/or project management responsibility;
 - provide cover against acts of terrorism, including any third party liability arising from such acts;
 - include public liability and third party liability insurance;
 - insure such other risks as a prudent company or other person in the same business as the Borrower would insure; and
 - insure such other risks in the Project as required by any applicable law in the country of the Project Site,
14. **Use of Investor proceeds**
 - The funds made available to the Issuer under the token issuance shall be utilized by the shareholders of the SPV for the purpose of developing other sustainable infrastructure assets
15. **Establish IoT framework**
 - The Issuer must provide Frigg with direct access to any smart meters (IoT devices physically installed on the operational asset) that track relevant operational data, or give Frigg permission to install own IoT devices to track operational performance

After these steps are complete, the ABT is securely on-line and can be accessed by millions of investors without the need for an IPO or fund offering.

5.6 Value Accrual on-chain



In this section we explain how Investors purchase an ABT and how it accrues value on the blockchain. The diagram above demonstrates deployment in the Ethereum mainnet specifically.

5.6.1 Trading on DeFi reduces transaction costs

Each ABT on the Frigg platform follows an ERC-20 smart contract standard. The ERC-20 standard is widely accepted, audited, and responsible for a majority of the \$100 billion⁶⁶ worth of assets locked in DeFi. The initial Frigg ERC-20 ABT represents a Zero-Coupon-Bond (ZCB). This is a fixed income instrument that does not pay interest in installments. Rather it trades at a discount when issued and is redeemable at full-face value at maturity. This includes the accrued value of the interest. In short, for each 1 \$USDC deposited, Investors are given an ABT granting their claim to (1 + asset-specific premium) \$USDC at a specific date (e.g. one calendar year later).

As each ABT is a bond, interest must be paid by the Issuer. We advise Issuers to conduct an open-market token buyback on the secondary market established on DEX (e.g., Uniswap) at the end of each year until maturity to minimize gas costs and tax implications.

Accepting stablecoins (e.g. \$USDC) instead of crypto-native assets (e.g. \$ETH) also reduces the price volatility that Issuers bear. \$USDC is issued by Circle Foundation⁶⁷ and will soon be publicly listed on the New York Stock Exchange. Circle offers unrivalled cost efficiency and convenience for Issuers to convert their stablecoins

⁶⁶ From DeFi Pulse
⁶⁷ <https://www.circle.com/en/>

into fiat currency such as Dollar or Euro.

5.6.2 The Benefits of Secondary Liquidity

The Microsite also provides a secondary market that allows Investors to trade and speculate at an expected fair value. We have set up Liquidity Pools, which are used to facilitate decentralized trading and lending, on secure DeFi exchanges such as Uniswap. This is beneficial for passive ABT token holders. They become Liquidity Providers (LPs) by depositing both ABTs and paired-tokens (e.g. stablecoins) into Liquidity Pools (LPs). In return, they earn fees from providing liquidity as Automatic Market Makers (AMMs), facilitating swaps between ABTs and stablecoins.

Since AMM is a recent invention in DeFi, here is an example of how Automatic Market Makers (AMMs) work:

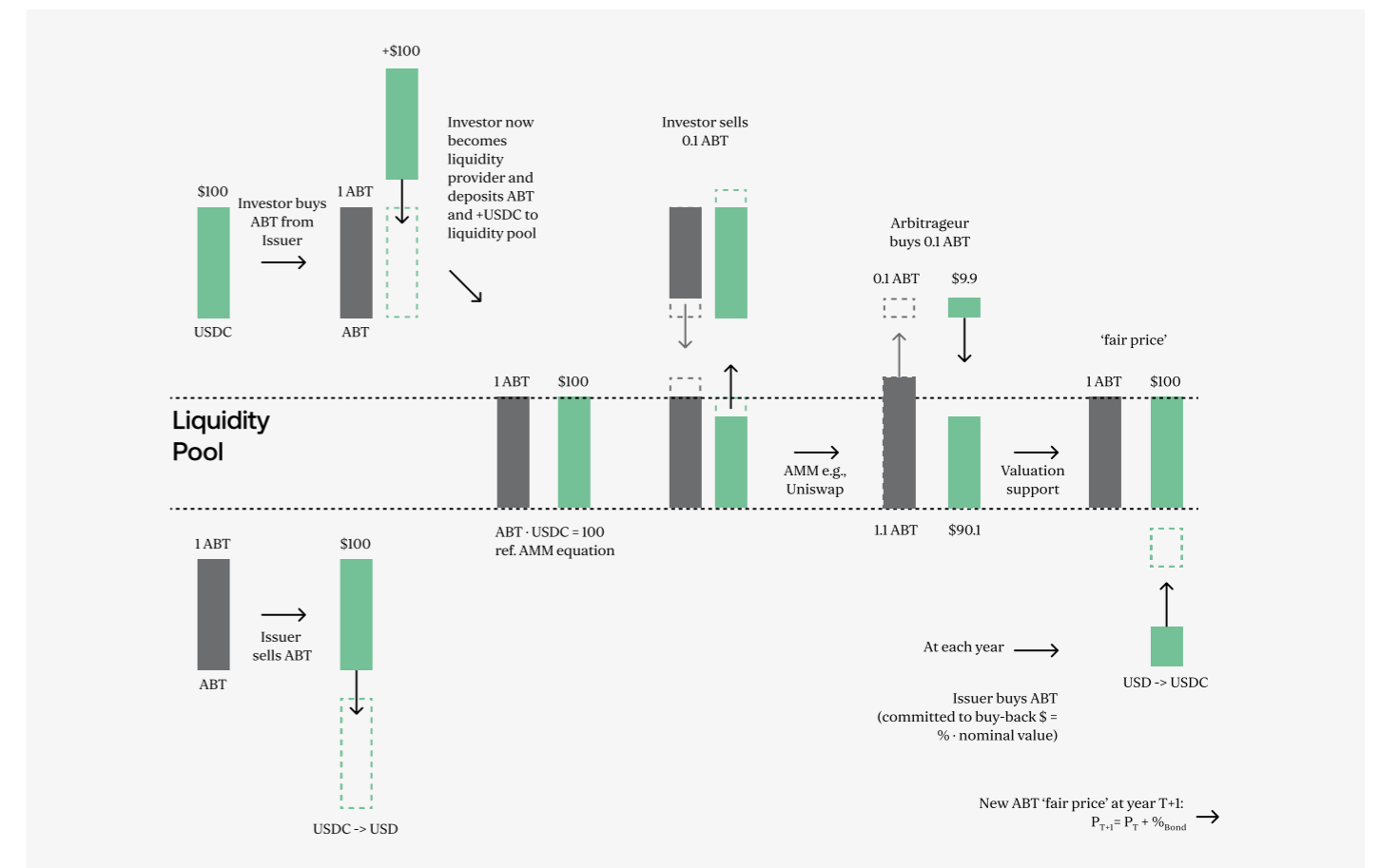


Fig. 15
How the Frigg Standard accrues fiat & crypto value

Fig. 16
How Liquidity Pool works over time.

- Passive ABT holders deposit 1 ABT and 100 \$USDC into the LP on Uniswap, setting the initial price to 1 ABT = 100 \$USDC (same as the launch price); they become Liquidity Providers
- As secondary investors trade in and out of ABT, the liquidity pool ratio adjusts
- Issuers buy their tokens back each year from secondary buybacks as a means to settle interest payments.

We believe that the market will have high demand for our ABTs, given their uncorrelated and attractive return profile. If market demand outstrips supply (which is dependent on the size of the initial bond offering), the secondary market for ABTs will have a high volume. This drives demand for swapping, increasing total swap fees, and thus providing a higher return for liquidity providers. We expect for this to take place.

Below is a more comprehensive cost-benefit calculation of becoming a LP:

Cost	Benefits
Opportunity cost for ABT - USDC	Swapping fees (0.3% fee for each transaction)
Impermeant loss ⁶⁸ (Pair-token trades below the deposit value)	Passive yield generation

5.6.3 DeFi composability provides stakeholders with augmented value and flexibility

Monetary value in DeFi is encoded in immutable smart contracts. Given that smart contracts are publicly trackable, and anyone can interact with them, DeFi works in such a way that resembles a series of modular building blocks, or ‘money legos’ as Andreesan Horowitz states⁶⁹. Composability is a design principle that refers to the inter-relationship of components. By adhering to contract standards like ERC-20⁷⁰, other protocols can build on top of our ABTs. In the future, we are excited by the possibilities that would stem from working with:

- **Permissioned/permissionless lending protocols** (e.g., FIAT DAO)⁷¹ to accept our fixed-income primitive ABTs as collateral
- **rate swap protocols** (e.g., Voltz)⁷² to accept ABTs as notional collateral for swaps
- **decentralized insurance protocols** (e.g., Nexus Mutual)⁷³ to insure against tail-risk defaults

This kind of composability is also possible in TradFi, however, it is only offered by investment banks at a significant fee that would only be viable for sizable institutional investors. This process has been historically hindered by legacy computer systems and piles of manual paperwork. DeFi has made investment products composable, affordable, and accessible to all investors.

5.6.4 Uncorrelated returns as an on-chain Treasury-bond equivalent

Infrastructure is treated as a real asset. Real assets represent tangible and productive facilities, property, plant, and equipment, that are present in the physical world. They are a core component of any portfolio for most sophisticated institutional investors. Real assets are also imperative for the functioning of society, energy systems, and the economy. Real asset investments are generally defined by several properties:

- stable cash flows
- inflation protection (asset outputs tend to increase in value with inflation e.g., energy, food, housing costs)
- non-cyclical and uncorrelated returns (i.e., returns are not substantially affected by recessions due to contracts or services that provide value in any economic condition)
- often asset returns are derived from income rather than capital appreciation
- a long investment horizon

Infrastructure represents an attractive asset in volatile times. Often, infrastructure has been considered a cousin to fixed income. Some types of infrastructure behave similarly, in that they have regular income and less volatility as equities. These include assets such as bridges, power grids or sewage systems.

⁶⁸ Impermanent Loss (IL) is a rather misleading term to describe downward price pressure; from [Binance Academy](#)

⁶⁹ From Andreesan Horowitz's [Composability is Innovation](#)

⁷⁰ We are also looking into ERC-1155 and ERC-3525 to create new fixed-income primitive on-chain

⁷¹ <https://fiatdao.com/>

⁷² <https://www.voltz.xyz/>

⁷³ <https://nexusmutual.io/>

As bond returns in TradFi have declined in the era of low interest rates, investors are looking for riskier high-yield bonds or infrastructure investments with better returns. We expect that the high demand for ABT may increase its secondary trading price to above the base index of 100. Its price movement could parallel that of Treasury-bond market in TradFi, leading to an inverse relationship between bond price and yield.

Historically, most infrastructure assets have been exclusively accessed by a selected group of institutional investors. Frigg opens this asset class up to all investor types.

5.6.5 The 4 Step Guide (Browse, Inform, Verify, and Trade) to purchase an ABT:

1. Browse

- On the Frigg websites (Frigg Universe or Frigg Globe) investors browse through a list of assets that provide information on exactly how much carbon has been prevented from entering the atmosphere because of the project
- The investors invest in Digitized Green Bonds (DGB) that are directly tied to sustainable infrastructure assets, which include hydro, solar, wind, carbon capture and storage, waste to energy, etc.



Fig. 17
The Frigg Universe
and tokenized projects

2. Inform

- The investor dives into different issuer's Microsites and specific ABTs on offer (an example provided in Fig 18)
- The Microsites, which is the issuer's domain, allow investors to explore transparency relevant information about the project and the DGB on offer (e.g., purpose of the issue, project summary, financials, carbon reductions, etc.)



Fig. 18
Enter the Issuers
Microsite

3. Verify

- Before investors can trade a DGB, they need to connect their digital wallet and complete an Anti-Money Laundering (AML) check. Fig 19 shows how the AML widget is integrated on the Microsite and Fig 21 how it is integrated in the backend
- An overlay appears with a prompt to connect a Wallet Connect compatible wallet (e.g. Metamask, Coinbase, Trust, Rainbow, etc.)
- If an AML check is already passed, the Investor can proceed with the trade
- Otherwise, another overlay appears, prompting the Investor to supply AML relevant information to a secure, third-party provider.⁷⁴ Frigg also provides the third-party provider with additional compliance standards to geofence non-sanctioned countries identified by Swiss regulation⁷⁵
- Once the AML/KYC check is passed (less than 2 minutes for natural persons and approx. 1-2 weeks for legal entities), investors can access all tokenized assets in the Frigg Universe

⁷⁴ Once an Investor passes the KYC check, the status is interoperable with other DeFi protocols

⁷⁵ Additional standards include filtering certain jurisdictions including the United States

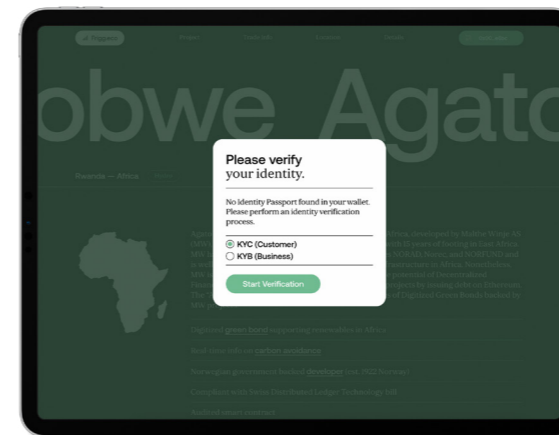


Fig. 19
The Microsite
AML check widget

4. Trade

- Investors are automatically directed to the trade widget to proceed with the intended trade. Depending on the investment phase of the bond, either the “Buy” (primary market), “Swap” (secondary market), or “Sell” button on the Microsite
 - Buy: The Investor completes a transaction by transferring stablecoins (e.g., \$USDC) and receiving an ABT that represents financial ownership of the security. The ABT sits at the Investor’s wallet under self-custody
 - Swap: After the issuance period and closing of the primary market sale, Investors can trade their ABT on a secondary market (e.g., Uniswap⁷⁶) via the Microsite
 - Sell: Once the DGB reaches maturity, investors that hold DGB’s can reclaim the Face Value in stablecoins (e.g., \$USDC)
- A real-time market price and a dashboard with trading volume metrics are displayed on the Microsite (data through API from DEX and Etherscan)
- The proceeds of each ABT sale are stored in a multi-sig escrow account that the Issuer uses to access liquidity and use for refinancing

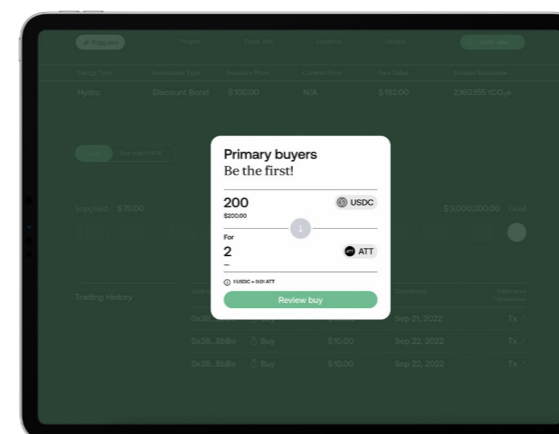


Fig. 20
The trade widget
on the Microsit

⁷⁶ [Uniswap pools](#)

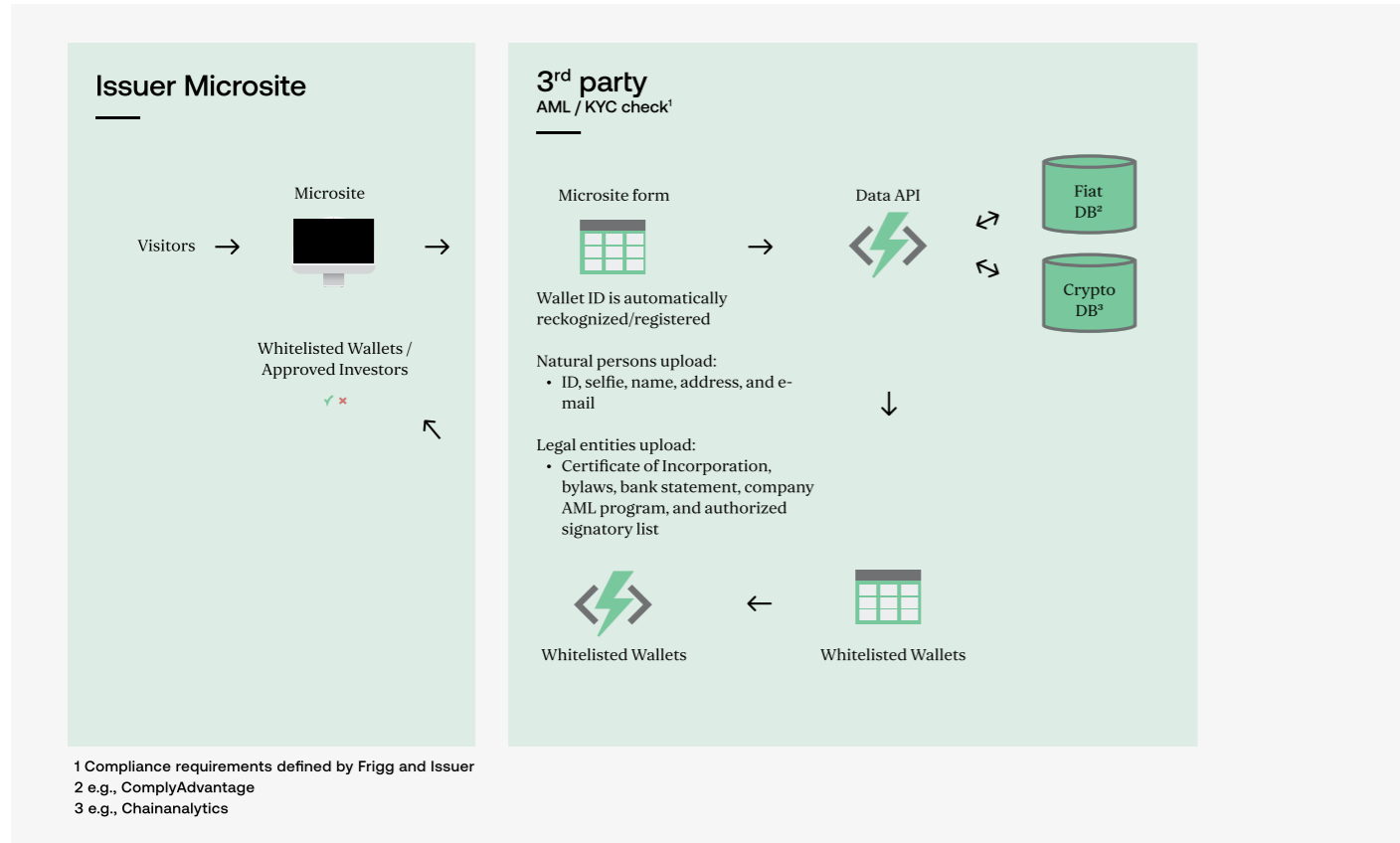


Fig. 21
 Investor AML/KYC
 accreditation process.

5.7 IoT transparency: Real-time, asset-level data on the blockchain

We believe that data transparency is key to establishing trust. We intend for Frigg to set the standard that bridges off-chain and asset-level data with on-chain storage and distribution. Figure 11 demonstrates how we integrate local IoT devices within our SaaS model (PGM websites) by circulating the data available for Investors' and public access.

We work with the Issuer to provide data for each sustainable renewable energy asset. Our group manages the deployment of IoT sensors if they are not already installed and integrates it with the PGM websites. These sensors measure key metrics at the asset level. For example, with renewable energy projects, they collect data such as:

- water flow (for hydropower assets)
- wind speed (for wind farms)
- sun exposure (for solar projects)
- the marketable kilowatt-hours (kWh) of electricity produced (for all infrastructure assets)

These sensors are connected to an IoT Hub that dispatches data to a cloud function. We host this privately and securely. The data is then displayed on the Frigg Portfolio, Frigg Globe, and the Microsite, open to public access.

We realize that this solution, while transparent, requires an element of trust because we display the data independently. In the future, we intend to implement a fully accountable iteration. Our vision is to directly upload each batch of data collected by IoT sensors to the blockchain on an hourly basis. As seen in Fig. 22, IoT raw data would be stored on-chain. Periodically, the data will also subject to external audits at the sensor level.

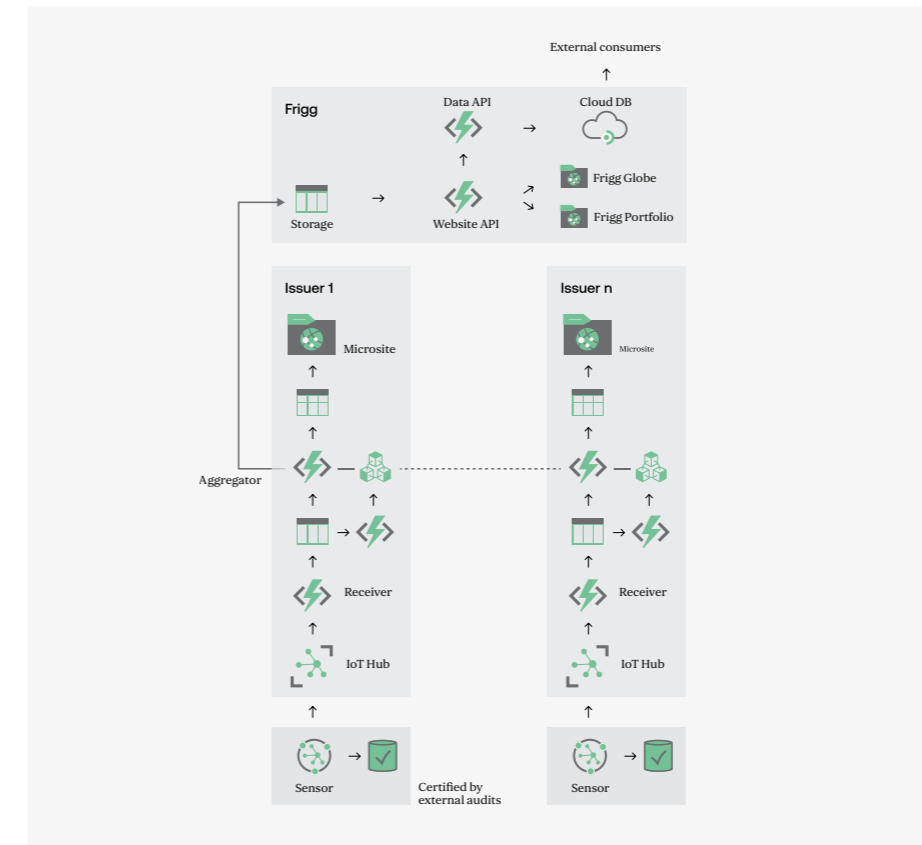


Fig. 22
 How Frigg integrates
 with local IoT.

6 Our 10-Year plan to combat Ragnarok: Software as a Wedge to DeFi

This section outlines our vision is to build a category-defining leader. We intend for our Asset-backed Tokenization (ABT) platform to be the standard to onboard Real-World Assets (RWAs) to DeFi. We outline how our Value-Accrual Standard and IoT Standard benefits infrastructure financing stakeholders by leveraging DeFi.

Stakeholders	The Benefits of Frigg's Value-Accrual Standard	The Benefits of Frigg's IoT Standard helps
Construction company	Drawdown and project payment executed automatically once milestones are reached.	X
Utility off-taker	Smart contract executes trustless payments trustless. Further, production default triggers automatic insurance protection	Secure (blockchain) storage and distribution of the amount of utility produced.
Project employees (incl. Operations and Maintenance)	Compensations and expenses automatically processed on-chain	Insights to historic IoT data allows for pattern recognition and early detection of defaults.
Investors	Bond tokens traded on Issuers' Microsite	24/7 tracking of real-time project performance

We are excited to see a future where project developers can receive all of their financing on-chain and pay their employees in stablecoins. DeFi offers a lower cost of capital and better experience for project developers and investors. Our roadmap to use software as a wedge, then scale beyond capital, is as below:

6.1 Short-term: Build trust and fine-tune standards

- Publish peer-reviewed academic articles: Our founders aim to publish a paper in a peer-reviewed journal. It will demonstrate the benefits of ABT for renewable energy project for investors and developers.
- Launch a Proof-of-Concept: ABT of an operational hydro project. (See Section 7)
- Launch Frigg on other Layer 1 blockchains that share our vision of carbon neutrality, emerging markets and Institutional DeFi.
- Take a lead role as a liquidity provider / arbitrageur: It is important for Frigg to have skin in the game by contributing to the liquidity of ABTs. We will function as both a liquidity provider (deposit ABTs and equivalent value in stablecoins on DEX), and an arbitrageur (buying ABTs when they fall below fair market value and selling back into market when the ABT reaches fair value). This enhances the liquidity and value for investors.

6.2 Medium-term: Expand our Scope of Service

- Move towards a trustless IoT standard by uploading IoT data directly to the blockchain.
- Secure a sizeable asset supply with a pipeline of stable operational sustainable infrastructure projects.
- Secure asset demand by establishing working partnerships with DeFi protocols with high Total Volume Locked (TVL) e.g. Aave and MakerDAO.
- Onboard traditional infrastructure investors to DeFi: if DeFi can be leveraged to finance projects before the Commercial Operation Date (COD), it can significantly improve the way cash is recycled by allowing investors pre-COD to refinance their position with fresh capital from investors in DeFi.

6.3 Long-term: Scale beyond capital

- Expand token product shelf e.g. carbon-offset, guarantees, native stablecoins backed by RWAs.
- Develop API as a service for TradFi financial services providers.
- Onboard sustainable infrastructure developers to DeFi entirely: We will consider this complete when corporate treasury, invoicing, and capital lending are all done on-chain.

7 Proof-of-Concept: Agatobwe

7.1 Scope

Agatobwe Hydropower Ltd. ("Agatobwe") operates a sustainable hydropower facility situated in Rwanda. The facility has been developed and financed by a Norwegian technology company ("Malthe Winje Infrapower" (MWIP⁷⁷)) that has been active in infrastructure development since 1922. Agatobwe has expressed interest to replace its current outstanding debt (currently provided by MWIP) with bonds issued as ledger-based securities in accordance with art. 973d of the Swiss Code of Obligations (the "CO").

For this purpose, Frigg has offered its services to develop and maintain a Microsite (the "Software") for Agatobwe (the "Issuer"), that contains the necessary technical capabilities for the Issuer to conduct its sales of "Agatobwe Bond Tokens (ABTs)". MWIP will use the proceeds received from refinancing Agatobwe to finance another hydropower facility that they are currently developing. By doing so, MWIP can avoid the involvement of other expensive stakeholders and finance upcoming projects through its own balance sheet.

Agatobwe generates revenue from the sale of electricity through a 25-year contracted offtake agreement, a Power Purchase Agreement (PPA). The energy off taker, Energy Utility Corporation Ltd. (EUCL), Rwanda government energy utility, pays Agatobwe an Energy Purchase Price (\$ / kWh) is indexed each contract year in accordance with the U.S. Urban Consumer's Price Index for all items less food and energy published by the United States of America, Department of Labor. The production and payments are recorded using immutable devices collected and stored by Frigg on its Microsoft Azure cloud system.

The average annual electricity consumption per capita in Rwanda 40 kWh / year. The estimated annual electricity output from Agatobwe of 2.2 GWh / year, and therefore equivalent to supplying ~55'000 individuals with clean and stable electricity in Rwanda. We leverage the electricity production of Agatobwe to give ATT Creditors instant information on the operating revenue and avoided greenhouse gas emissions.

The avoided CO₂e emissions are calculated using methodology (Avoided-Emissions-Methodology) used by the International Renewable Energy Agency (IRENA), an intergovernmental agency⁷⁸ by replacing non-renewables in Rwanda. It provides an estimate of the carbon avoided due to an uptake in renewables. By adding more renewables to the overall electricity production mix, the carbon footprint will decrease versus the status-quo.

For example, it is estimated that Agatobwe will generate 2.2 GWh of electricity in 2022. Assuming that Rwanda has the same non-renewable electricity mix in year 2022 as it had for year 2020 (62% Natural Gas and 38% Oil), the avoided CO₂e as a result of replacing the non-renewable electricity mix with renewable electricity generated by Agatobwe is given by:

⁷⁷ Disclaimer: frigg.eco AG is an indirect majority shareholder of Malthe Winje Infrapower (MWIP), a sustainable infrastructure developer.

⁷⁸ Avoided emissions calculator from IRENA – assuming the electricity generation replaces the fossil fuel mix generation the country currently has.

- CO₂e Avoided = 2.2 GWh × (62% × 469 + 38% × 840 – 4) tCO₂e / GWh
- CO₂e Avoided = 1,390 tCO₂e

The values 469, 840, and 4 represent the GHG emissions per GWh (tCO₂e / GWh) from natural gas, oil, and hydropower respectively.

7.2 Terms of issue

The investment opportunity represents a Digitized Green Bond (the “Issue”) with nominal value \$ 3,000,000 that replaces the Sr. debt and optimizes the capital structure of Agatobwe Hydro Power Ltd. MW will use the proceeds from the Issue to finance the construction of other hydropower facilities in the area. Creditors are therefore indirectly funding renewable energy development in East Africa through MW. s (the “CO”).

The Issue has been divided into 30,000 fractions with nominal value of \$ 100 each and registered as ledger-based securities (the “Tokens”) on the Ethereum blockchain as ERC-20 tokens. The Tokens are named “AgaTobwe Token bonds” (ATT) in accordance with the Swiss Code of Obligations and the Federal Act on the Adaptation of Federal Law to Developments in Distributed Ledger Technology (DLT bill).

Creditors of ATT are bound to the Terms of Issue and Registration Agreement. The bond pays an expected implied yield of 4% with lump-sum payment of \$ 5,466,356 at maturity in 15 years. The Issuer aims to continuously repurchase bonds in the secondary market, using USDC, a dollar backed stablecoin.

During the Subscription Period, the Bonds will be available for subscription on the Issuers Microsite. Each Bond price is fixed to \$100 throughout the Subscription Period. The Bonds do not bear interest. Rather, the Issuer offers to repurchase Bonds each year on the secondary market (Uniswap) for a total target purchase price of at least 4% of the outstanding nominal amount of the tokens until the end of the Term.

The Issue has a fixed term of 15 years (“Term”). The Issuer shall repay the Issue without prior request for payment on the [Issue Date +15 yrs] (“End of Term”) at face value. The Issuer may at any time acquire any number of Bonds for own investment or repayment purposes, in which case the Issuer shall update the Current Total Nominal Value on the Website within reasonable time.

No special security is provided in favor of this Issue. If the Issue and interest payments are outstanding, the Issuer undertakes not to provide any other bonds, bills, cash bills, debentures, or similar debt obligations with special security without providing this Issue with the same or equivalent security.

7.3 Legal assessment

The Bonds constitute securities and, by being issued as ledger-based securities, qualify as asset tokens. As their total face value does not exceed CHF 8 million, they can be offered without the prior publication of a prospectus. A key information document must be produced if the Bonds are offered to retail investors.

It is our view⁷⁹ that the Bonds do not qualify as deposits within the meaning of the Banking Act if the issuer publishes the information required by art. 5 para. 3 lit. b BO using one or several of the means enumerated in art. 64 para. 3 FINSA. The publication of the information in the key information document, or its inclusion by reference, suffices to meet this requirement. Lastly, the Bonds and the offering of the Bonds in Switzerland are not subject to the CISA.

⁷⁹ frigg.eco AG has foregone a thorough legal review to attain affirmation that our assumptions are valid.

8 Our Team: “The legends of Gods and Heroes”

The name Frigg comes from the eponymous Goddess that belongs to a race of noble Gods, also known as the race of Æsir in Viking mythology. Our Viking forefathers believed that the Æsir existed to protect humankind from evil. It was also believed that heroic Viking Shieldmaidens (women) and Warriors (men) that died in battle against evil that resided on earth, would join the Gods in afterlife to fight alongside each other in the ultimate battle against evil uprising that, if evil presided, would mean the end of the world, known to the Vikings as Ragnarok. Valhalla will represent the room where frigg holds its Board of Director meetings. In Valhalla there are 640 portals, through each of which, 960 warriors might march in abreast.

8.1 Frigg investors — “8/13 Viking Gods”

Besides Odin there are twelve other Æsir who held to be chief deities of the universe; among themselves they had apportioned rule over all things, and each day they held counsel about what events should come to pass. Odin is their lord; he is supreme, mightiest of the gods, the preserver of all things, and therefore called the All-Father. The twelve major deities in Viking mythology were — in addition to Odin — Thor, Balder, Njord, Frey, Tyr, Heimdal, Bragi, Forseti, Hod, Vidar, Vali, and Ull.

- **Odin** (The Chief) – ...
- **Thor** (The Rainman) – ...
- **Vali** (The Archer) – ...
- **Týr** (The Judge) – ...
- **Heimdal** (The Guardian) – ...
- **Balder** (The Beloved) – ...
- **Forseti** (The Speaker of Law) – ...
- **Njord** (The Seafarer) – ...

... **Frey** (The Prosperity God), **Bragi** (The Poet), **Hod** (The Vigorous), **Vidar** (The Do'er), **Ull** (The Runner) – reserved for future Frigg Gods

8.2 Frigg operations - “11/960 Viking Warriors”

- **Ebbe** (The Brave) – Prof. Dr. Markus Leippold
- **Ragnar** (The Rogue/Fighter) – Philip Berntsen
- **Floki** (The Tech King) – Francesco Leonetti
- **Seer** (The Visionary) – Tommy Back
- **Bjørn** (The Tank) – Adam Straight
- **Tanaruz** (The Mage) – Olivier Winkler
- **Angrboda** (The Magician) – Sergio Lavanga
- **Rollo** (The Cleric) – Stefan Jandl
- **Åse** (The Wordsmith) – Jennifer Shirin
- **Birger** (The Helper) – Oliver Carmignani
- **Aslaug** (The Number Cruncher) – Patrick Zumbühl *ad-interim*

... **949** – reserved for future Frigg's

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