

# Beyond the freeze

Blockchain's revival after  
the Crypto Winter

January 2023



This marketing communication is for professional investors and qualified clients/sophisticated investors. Investors should read the legal documents prior to investing.

# Contents

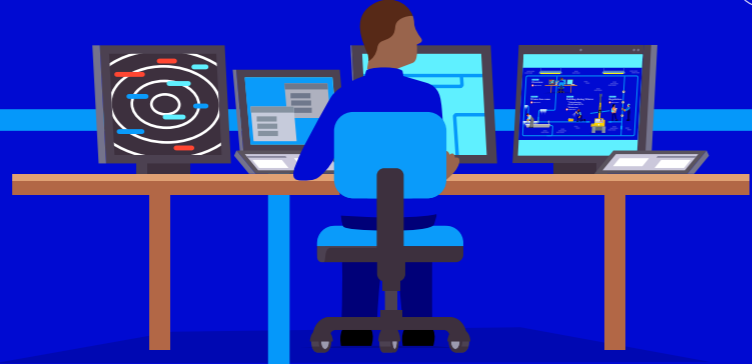
“ If winter comes, can spring be far behind?”

Shelley

Section 1

## Overview

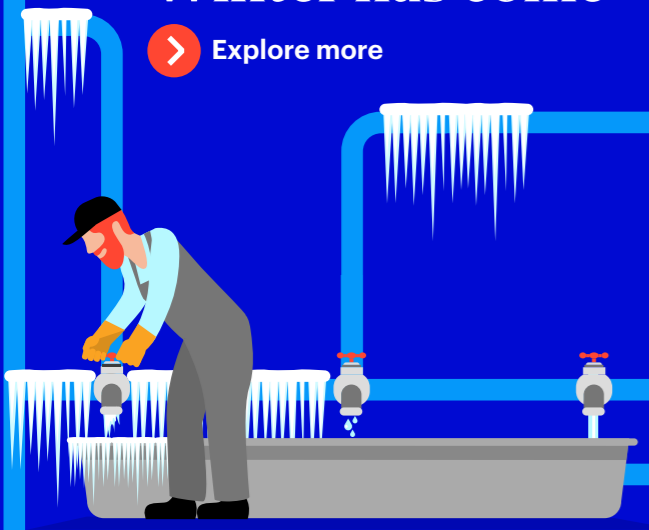
> Explore more



Section 2

## Winter has come

> Explore more



Section 3

## Building during winter

- >Tokenisation
- >Web3 and NFTs
- >Metaverse

> Explore more



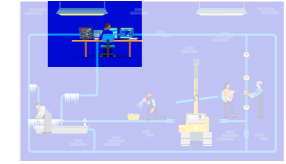
Section 4

## The case for regulation

> Explore more



# Overview



2022 was a difficult year for the blockchain ecosystem. Major cryptoassets declined and several market participants failed. Yet amid the setbacks, building on blockchain continues and parts of the ecosystem functionality remain robust, and multiple surveys show continued investor interest in digital assets.

2022 headlines focused on declining cryptoasset values, failures of centralised entities, such as Celsius and FTX due to liquidity and governance issues (see 'Winter has come' section), and even charges against senior figures.

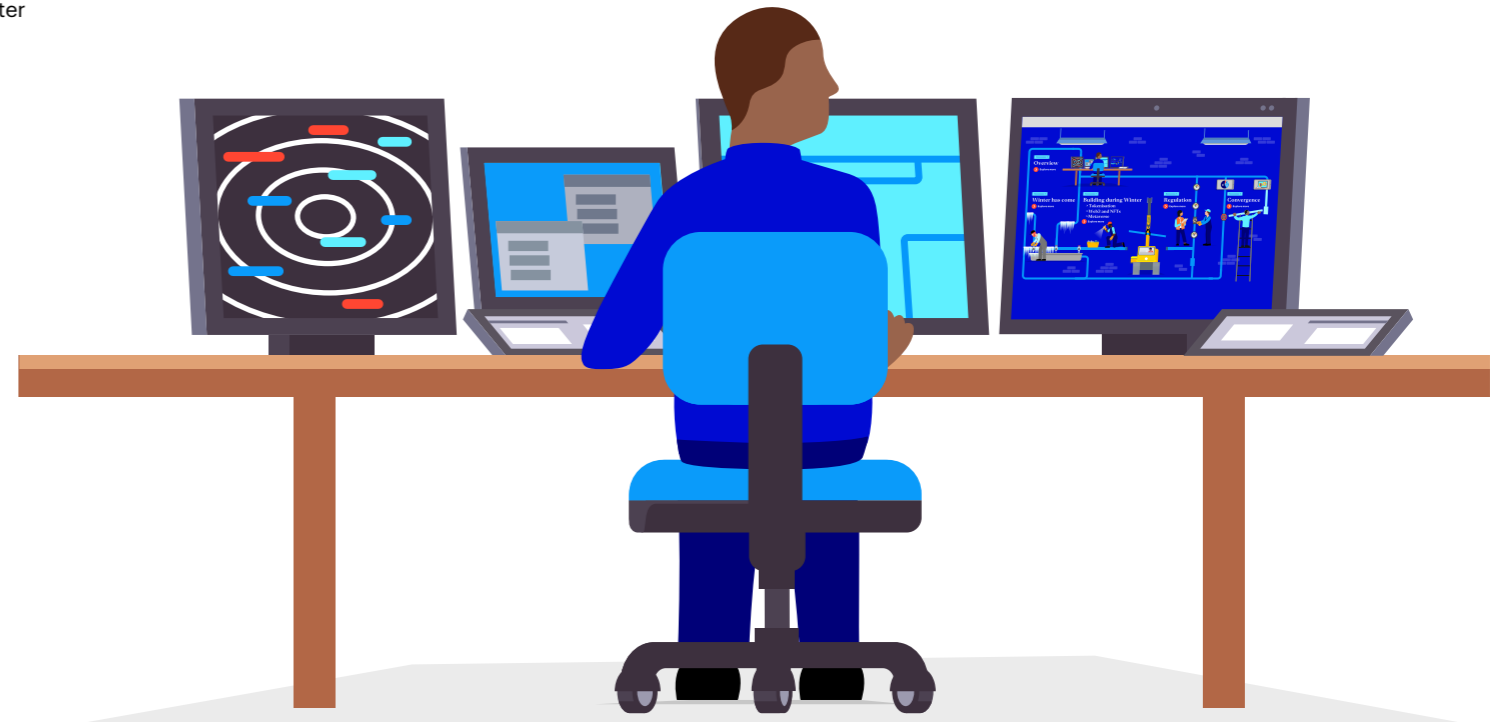
But in other parts of the blockchain ecosystem, Decentralised Finance (DeFi) protocols continued to function as designed. In fact, they experienced double-digit growth in the seven days following FTX's collapse, according to Nansen, though it should be noted that theft and fraud remain an issue.

Meanwhile, traditional financial markets have borrowed blockchain technologies and slowly embraced tokenised assets due to the benefits of reduced cost, atomic settlement and increased liquidity. Even some Central Banks have explored and implemented blockchain as an enabler of Central Bank Digital Currency (CBDC).

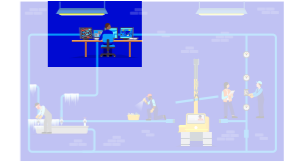
Looking into the distance, we can also see the early formation of Web3 and the digital worlds of the metaverse(s). Web3 promises to use decentralised models to provide ownership and rewards to creators and consumers.

Estimates of the size of the metaverse economy vary from \$5 trillion to \$13 trillion by 2030 (according to Citibank, McKinsey, Goldman Sachs and Morgan Stanley), based on development and sales of virtual land and buildings, as well as art and artefacts, such as NFTs. Additional metaverse applications include new forms of social interaction, collaborative work solutions, digital twin process mapping, and education and fitness.

It's fascinating to witness the blockchain ecosystem's evolution from the original innovation of Bitcoin 14 years ago, beyond crypto markets into greater applications such as asset tokenisation, Web3 and metaverse.



# Overview



2022 was a difficult year for the blockchain ecosystem. Major cryptoassets declined and several market participants failed. Yet amid the setbacks, building on blockchain continues and parts of the ecosystem functionality remain robust, and multiple surveys show continued investor interest in digital assets.

2022 headlines focused on declining cryptoasset values, failures of centralised entities, such as Celsius and FTX due to liquidity and governance issues (see 'Winter has come' section), and even charges against senior figures.

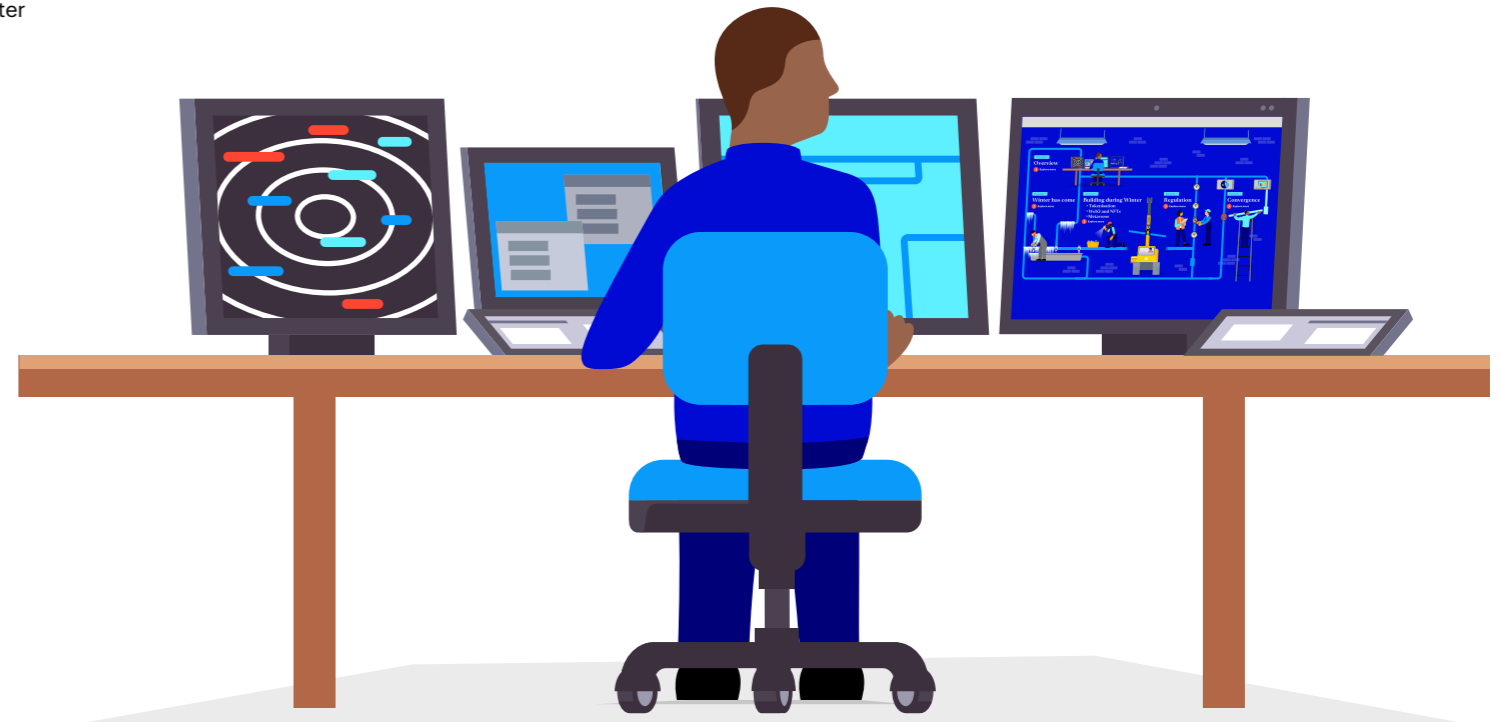
But in other parts of the blockchain ecosystem, Decentralised Finance (DeFi) protocols continued to function as designed. In fact, they experienced double-digit growth in the seven days following FTX's collapse, according to Nansen, though it should be noted that theft and fraud remain an issue.

Meanwhile, traditional financial markets have borrowed blockchain technologies and slowly embraced tokenised assets due to the benefits of reduced cost, atomic settlement and increased liquidity. Even some Central Banks have explored and implemented blockchain as an enabler of Central Bank Digital Currency (CBDC).

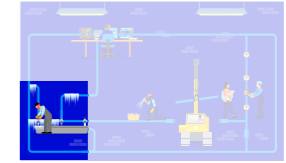
Looking into the distance, we can also see the early formation of Web3 and the digital worlds of the metaverse(s). Web3 promises to use decentralised models to provide ownership and rewards to creators and consumers.

Estimates of the size of the metaverse economy vary from \$5 trillion to \$13 trillion by 2030 (according to Citibank, McKinsey, Goldman Sachs and Morgan Stanley), based on development and sales of virtual land and buildings, as well as art and artefacts, such as NFTs. Additional metaverse applications include new forms of social interaction, collaborative work solutions, digital twin process mapping, and education and fitness.

It's fascinating to witness the blockchain ecosystem's evolution from the original innovation of Bitcoin 14 years ago, beyond crypto markets into greater applications such as asset tokenisation, Web3 and metaverse.



# Winter has come



While crypto naysayers have been warning “winter is coming” for some time, 2022 has shown that winter is most definitely here, with challenges garnering most attention around the blockchain ecosystem.

## Unprecedented challenges

From the “DeFi Summer” of 2020 and peak NFTs in 2021, 2022 has turned into a year of reckoning.

Notable events this year include the collapse of Terra – the algorithmic (not so) stablecoin, Celsius, 3 Arrows Capital, Voyager and, most calamitous of all, FTX.

FTX’s failure is particularly concerning in that it provided loans to Voyager and BlockFi and bought assets from Three Arrows, only to suffer its own liquidity crunch based on exposure to its own FTT token and poor governance regarding links with sister company Alameda Research.

## FTX: behind the fall

On 10 November, FTX’s assets were frozen by its local Bahamian regulator, and it filed for bankruptcy protection in the US the following day. Its failure was allegedly caused in part by:

- Alameda’s very large holding of FTT tokens, issued by FTX
- Movement of client assets from FTX to Alameda to support proprietary trading
- The “complete failure” of corporate control and a “complete absence of trustworthy financial information”, according to John Ray III who took over as FTX CEO

## Green shoots

Amid all the debris of 2022, however, there are several green shoots among the broader marketplace.

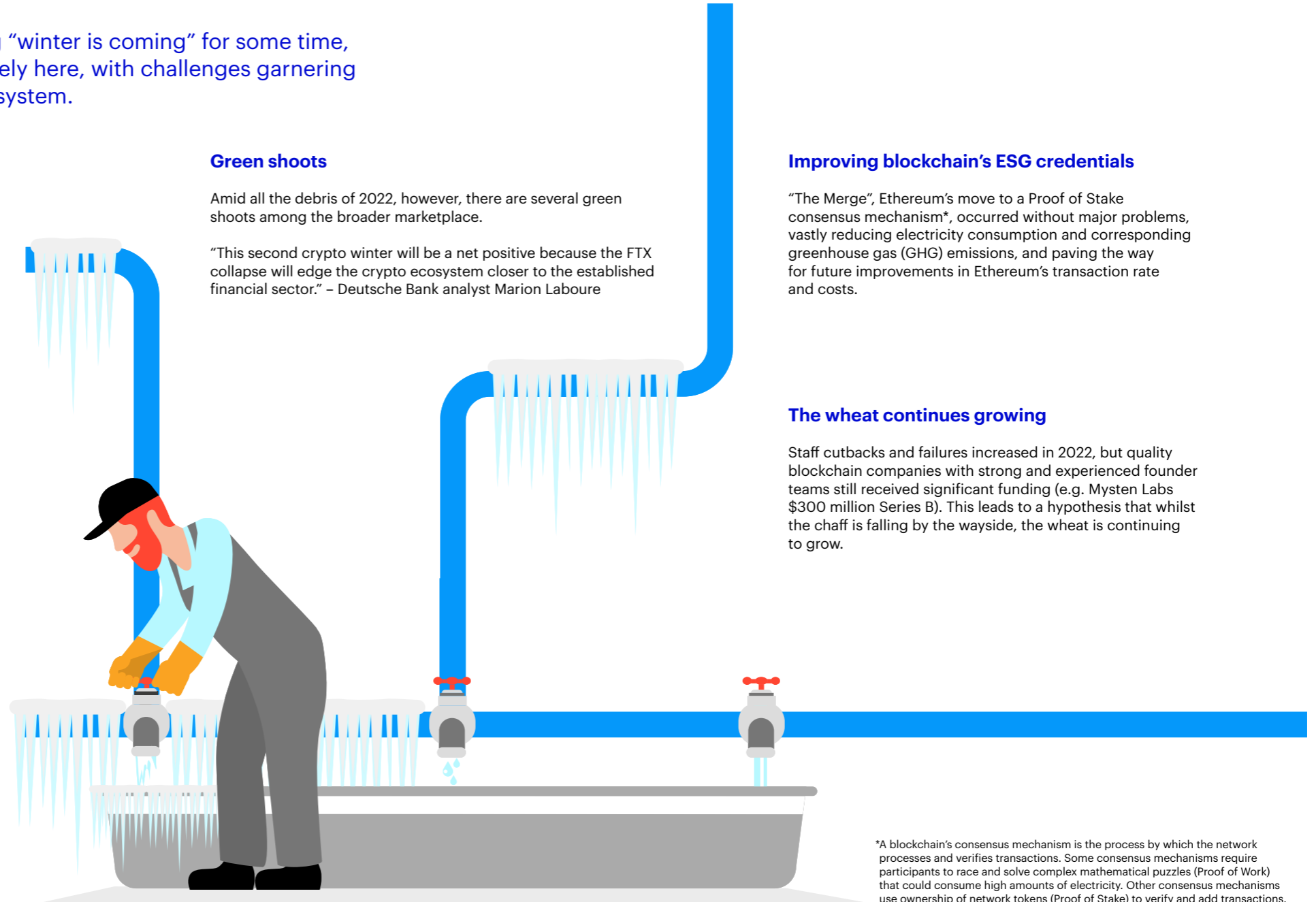
“This second crypto winter will be a net positive because the FTX collapse will edge the crypto ecosystem closer to the established financial sector.” – Deutsche Bank analyst Marion Laboure

## Improving blockchain’s ESG credentials

“The Merge”, Ethereum’s move to a Proof of Stake consensus mechanism\*, occurred without major problems, vastly reducing electricity consumption and corresponding greenhouse gas (GHG) emissions, and paving the way for future improvements in Ethereum’s transaction rate and costs.

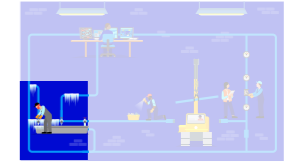
## The wheat continues growing

Staff cutbacks and failures increased in 2022, but quality blockchain companies with strong and experienced founder teams still received significant funding (e.g. Mysten Labs \$300 million Series B). This leads to a hypothesis that whilst the chaff is falling by the wayside, the wheat is continuing to grow.



\*A blockchain’s consensus mechanism is the process by which the network processes and verifies transactions. Some consensus mechanisms require participants to race and solve complex mathematical puzzles (Proof of Work) that could consume high amounts of electricity. Other consensus mechanisms use ownership of network tokens (Proof of Stake) to verify and add transactions.

# Winter has come



While crypto naysayers have been warning “winter is coming” for some time, 2022 has shown that winter is most definitely here, with challenges garnering most attention around the blockchain ecosystem.

## Unprecedented challenges

From the “DeFi Summer” of 2020 and peak NFTs in 2021, 2022 has turned into a year of reckoning.

Notable events this year include the collapse of Terra – the algorithmic (not so) stablecoin, Celsius, 3 Arrows Capital, Voyager and, most calamitous of all, FTX.

FTX’s failure is particularly concerning in that it provided loans to Voyager and BlockFi and bought assets from Three Arrows, only to suffer its own liquidity crunch based on exposure to its own FTT token and poor governance regarding links with sister company Alameda Research.

## FTX: behind the fall

On 10 November, FTX’s assets were frozen by its local Bahamian regulator, and it filed for bankruptcy protection in the US the following day. Its failure was allegedly caused in part by:

- Alameda’s very large holding of FTT tokens, issued by FTX
- Movement of client assets from FTX to Alameda to support proprietary trading
- The “complete failure” of corporate control and a “complete absence of trustworthy financial information”, according to John Ray III who took over as FTX CEO

## Green shoots

Amid all the debris of 2022, however, there are several green shoots among the broader marketplace.

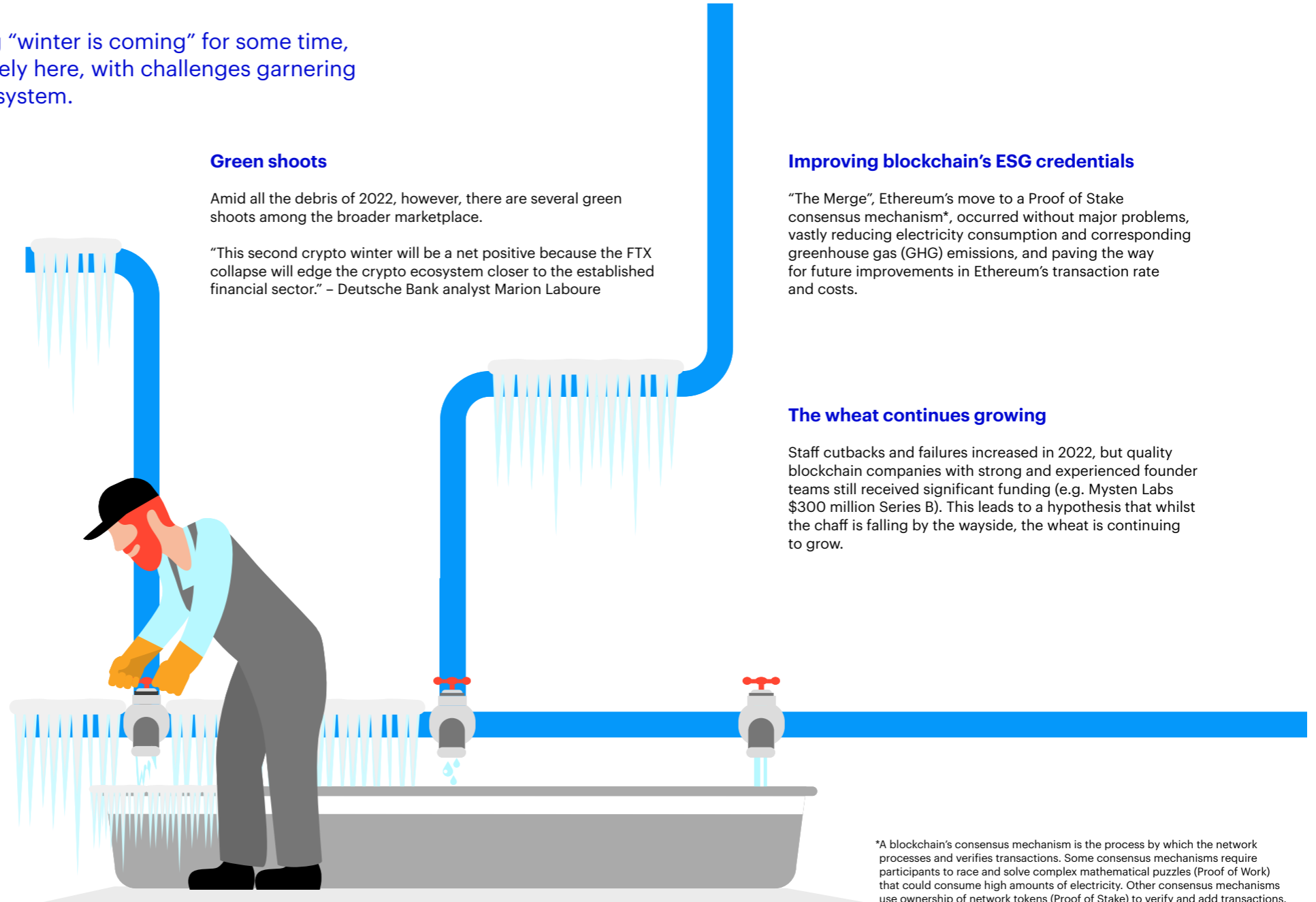
“This second crypto winter will be a net positive because the FTX collapse will edge the crypto ecosystem closer to the established financial sector.” – Deutsche Bank analyst Marion Laboure

## Improving blockchain’s ESG credentials

“The Merge”, Ethereum’s move to a Proof of Stake consensus mechanism\*, occurred without major problems, vastly reducing electricity consumption and corresponding greenhouse gas (GHG) emissions, and paving the way for future improvements in Ethereum’s transaction rate and costs.

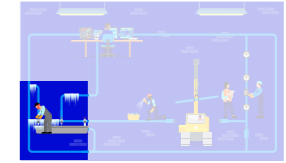
## The wheat continues growing

Staff cutbacks and failures increased in 2022, but quality blockchain companies with strong and experienced founder teams still received significant funding (e.g. Mysten Labs \$300 million Series B). This leads to a hypothesis that whilst the chaff is falling by the wayside, the wheat is continuing to grow.



\*A blockchain’s consensus mechanism is the process by which the network processes and verifies transactions. Some consensus mechanisms require participants to race and solve complex mathematical puzzles (Proof of Work) that could consume high amounts of electricity. Other consensus mechanisms use ownership of network tokens (Proof of Stake) to verify and add transactions.

# Winter has come



While crypto naysayers have been warning “winter is coming” for some time, 2022 has shown that winter is most definitely here, with challenges garnering most attention around the blockchain ecosystem.

## Unprecedented challenges

From the “DeFi Summer” of 2020 and peak NFTs in 2021, 2022 has turned into a year of reckoning.

Notable events this year include the collapse of Terra – the algorithmic (not so) stablecoin, Celsius, 3 Arrows Capital, Voyager and, most calamitous of all, FTX.

FTX’s failure is particularly concerning in that it provided loans to Voyager and BlockFi and bought assets from Three Arrows, only to suffer its own liquidity crunch based on exposure to its own FTT token and poor governance regarding links with sister company Alameda Research.

## FTX: behind the fall

On 10 November, FTX’s assets were frozen by its local Bahamian regulator, and it filed for bankruptcy protection in the US the following day. Its failure was allegedly caused in part by:

- Alameda’s very large holding of FTT tokens, issued by FTX
- Movement of client assets from FTX to Alameda to support proprietary trading
- The “complete failure” of corporate control and a “complete absence of trustworthy financial information”, according to John Ray III who took over as FTX CEO

## Green shoots

Amid all the debris of 2022, however, there are several green shoots among the broader marketplace.

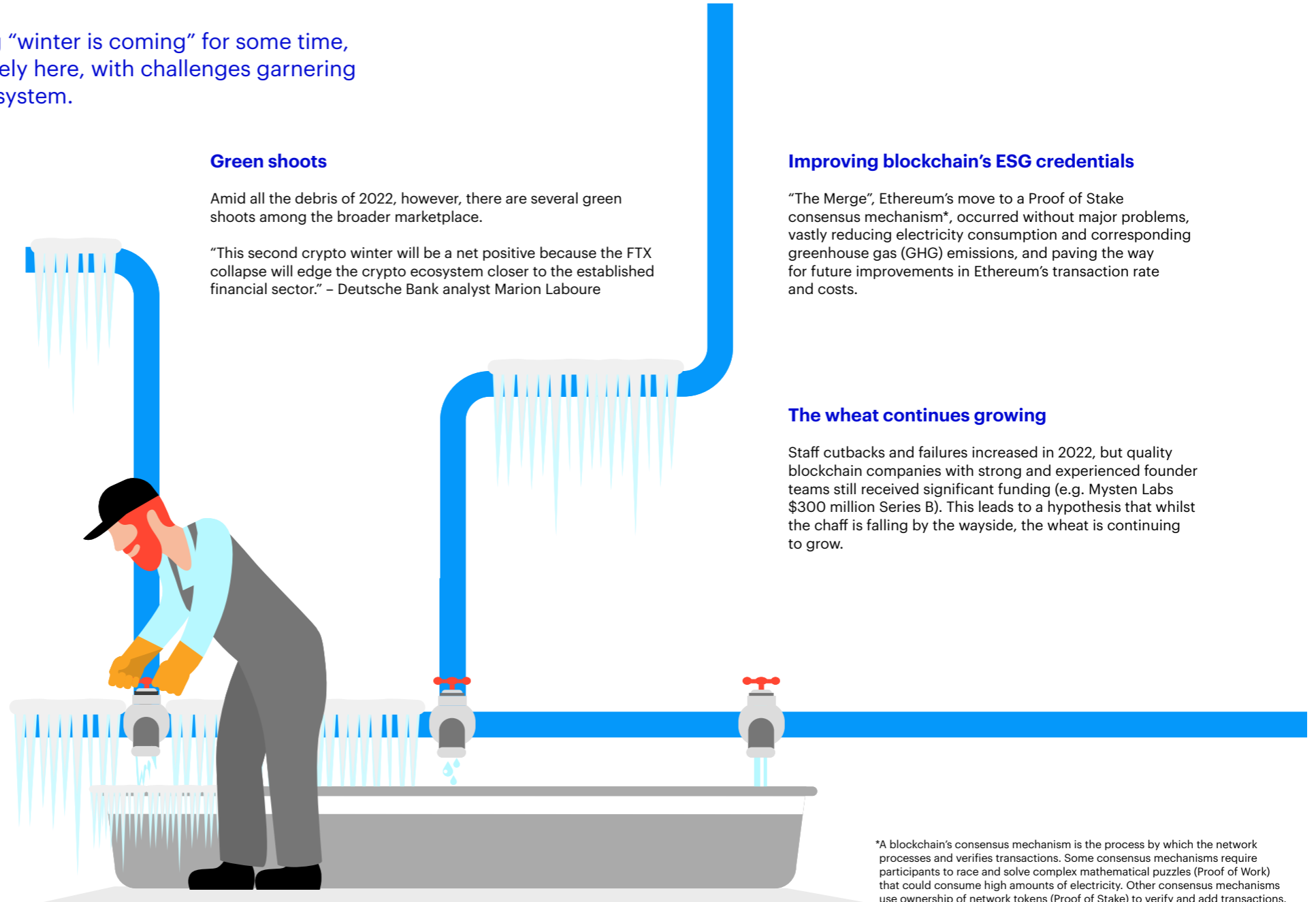
“This second crypto winter will be a net positive because the FTX collapse will edge the crypto ecosystem closer to the established financial sector.” – Deutsche Bank analyst Marion Laboure

## Improving blockchain’s ESG credentials

“The Merge”, Ethereum’s move to a Proof of Stake consensus mechanism\*, occurred without major problems, vastly reducing electricity consumption and corresponding greenhouse gas (GHG) emissions, and paving the way for future improvements in Ethereum’s transaction rate and costs.

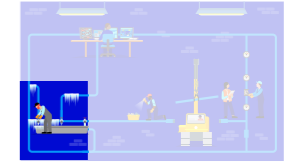
## The wheat continues growing

Staff cutbacks and failures increased in 2022, but quality blockchain companies with strong and experienced founder teams still received significant funding (e.g. Mysten Labs \$300 million Series B). This leads to a hypothesis that whilst the chaff is falling by the wayside, the wheat is continuing to grow.



\*A blockchain’s consensus mechanism is the process by which the network processes and verifies transactions. Some consensus mechanisms require participants to race and solve complex mathematical puzzles (Proof of Work) that could consume high amounts of electricity. Other consensus mechanisms use ownership of network tokens (Proof of Stake) to verify and add transactions.

# Winter has come



While crypto naysayers have been warning “winter is coming” for some time, 2022 has shown that winter is most definitely here, with challenges garnering most attention around the blockchain ecosystem.

## Unprecedented challenges

From the “DeFi Summer” of 2020 and peak NFTs in 2021, 2022 has turned into a year of reckoning.

Notable events this year include the collapse of Terra – the algorithmic (not so) stablecoin, Celsius, 3 Arrows Capital, Voyager and, most calamitous of all, FTX.

FTX’s failure is particularly concerning in that it provided loans to Voyager and BlockFi and bought assets from Three Arrows, only to suffer its own liquidity crunch based on exposure to its own FTT token and poor governance regarding links with sister company Alameda Research.

## FTX: behind the fall

On 10 November, FTX’s assets were frozen by its local Bahamian regulator, and it filed for bankruptcy protection in the US the following day. Its failure was allegedly caused in part by:

- Alameda’s very large holding of FTT tokens, issued by FTX
- Movement of client assets from FTX to Alameda to support proprietary trading
- The “complete failure” of corporate control and a “complete absence of trustworthy financial information”, according to John Ray III who took over as FTX CEO

## Green shoots

Amid all the debris of 2022, however, there are several green shoots among the broader marketplace.

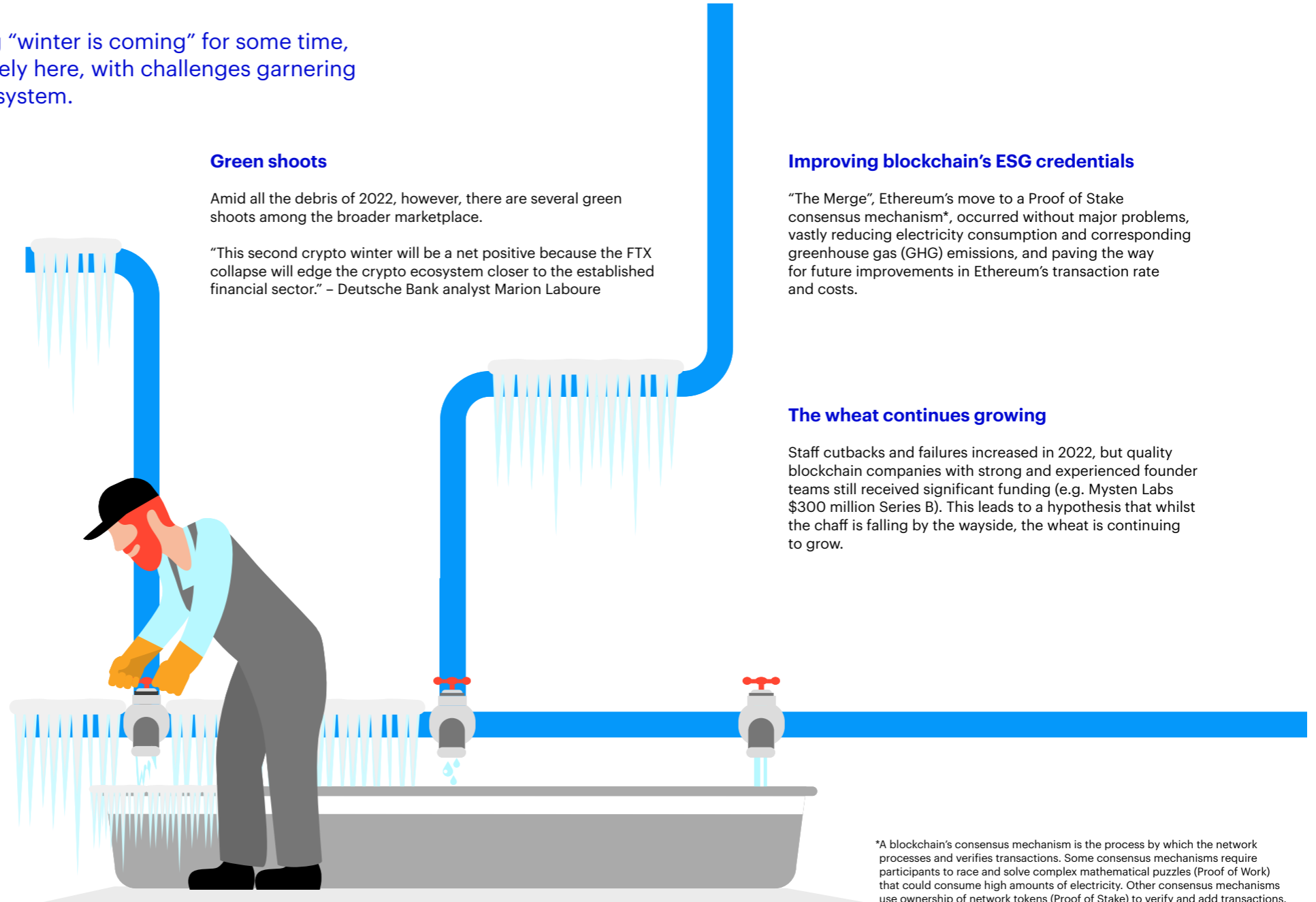
“This second crypto winter will be a net positive because the FTX collapse will edge the crypto ecosystem closer to the established financial sector.” – Deutsche Bank analyst Marion Laboure

## Improving blockchain’s ESG credentials

“The Merge”, Ethereum’s move to a Proof of Stake consensus mechanism\*, occurred without major problems, vastly reducing electricity consumption and corresponding greenhouse gas (GHG) emissions, and paving the way for future improvements in Ethereum’s transaction rate and costs.

## The wheat continues growing

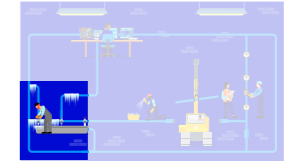
Staff cutbacks and failures increased in 2022, but quality blockchain companies with strong and experienced founder teams still received significant funding (e.g. Mysten Labs \$300 million Series B). This leads to a hypothesis that whilst the chaff is falling by the wayside, the wheat is continuing to grow.



\*A blockchain’s consensus mechanism is the process by which the network processes and verifies transactions. Some consensus mechanisms require participants to race and solve complex mathematical puzzles (Proof of Work) that could consume high amounts of electricity. Other consensus mechanisms use ownership of network tokens (Proof of Stake) to verify and add transactions.



# Winter has come



While crypto naysayers have been warning “winter is coming” for some time, 2022 has shown that winter is most definitely here, with challenges garnering most attention around the blockchain ecosystem.

## Unprecedented challenges

From the “DeFi Summer” of 2020 and peak NFTs in 2021, 2022 has turned into a year of reckoning.

Notable events this year include the collapse of Terra – the algorithmic (not so) stablecoin, Celsius, 3 Arrows Capital, Voyager and, most calamitous of all, FTX.

FTX’s failure is particularly concerning in that it provided loans to Voyager and BlockFi and bought assets from Three Arrows, only to suffer its own liquidity crunch based on exposure to its own FTT token and poor governance regarding links with sister company Alameda Research.

## FTX: behind the fall

On 10 November, FTX’s assets were frozen by its local Bahamian regulator, and it filed for bankruptcy protection in the US the following day. Its failure was allegedly caused in part by:

- Alameda’s very large holding of FTT tokens, issued by FTX
- Movement of client assets from FTX to Alameda to support proprietary trading
- The “complete failure” of corporate control and a “complete absence of trustworthy financial information”, according to John Ray III who took over as FTX CEO

## Green shoots

Amid all the debris of 2022, however, there are several green shoots among the broader marketplace.

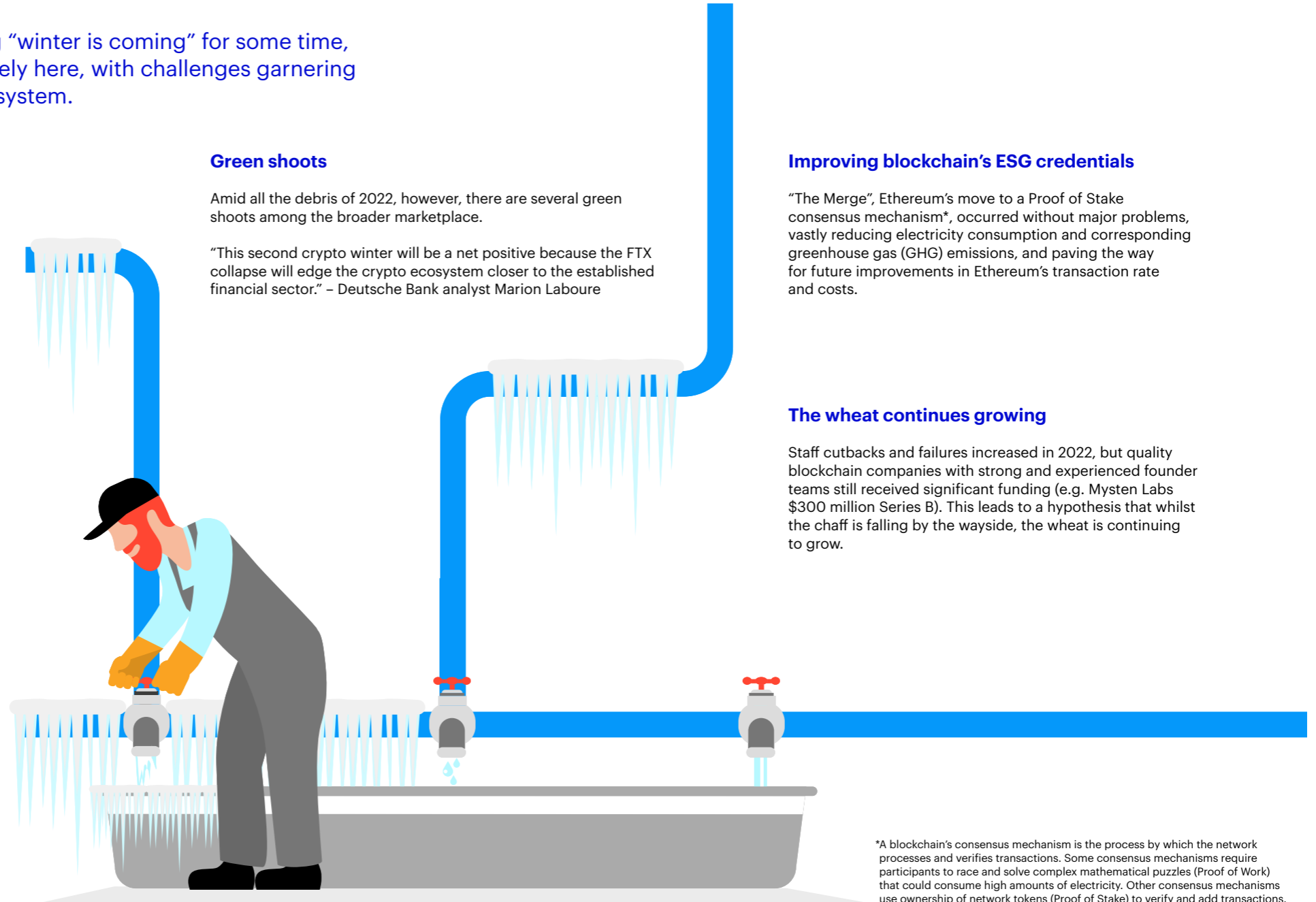
“This second crypto winter will be a net positive because the FTX collapse will edge the crypto ecosystem closer to the established financial sector.” – Deutsche Bank analyst Marion Laboure

## Improving blockchain’s ESG credentials

“The Merge”, Ethereum’s move to a Proof of Stake consensus mechanism\*, occurred without major problems, vastly reducing electricity consumption and corresponding greenhouse gas (GHG) emissions, and paving the way for future improvements in Ethereum’s transaction rate and costs.

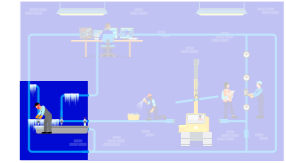
## The wheat continues growing

Staff cutbacks and failures increased in 2022, but quality blockchain companies with strong and experienced founder teams still received significant funding (e.g. Mysten Labs \$300 million Series B). This leads to a hypothesis that whilst the chaff is falling by the wayside, the wheat is continuing to grow.



\*A blockchain’s consensus mechanism is the process by which the network processes and verifies transactions. Some consensus mechanisms require participants to race and solve complex mathematical puzzles (Proof of Work) that could consume high amounts of electricity. Other consensus mechanisms use ownership of network tokens (Proof of Stake) to verify and add transactions.

# Winter has come



While crypto naysayers have been warning “winter is coming” for some time, 2022 has shown that winter is most definitely here, with challenges garnering most attention around the blockchain ecosystem.

## Unprecedented challenges

From the “DeFi Summer” of 2020 and peak NFTs in 2021, 2022 has turned into a year of reckoning.

Notable events this year include the collapse of Terra – the algorithmic (not so) stablecoin, Celsius, 3 Arrows Capital, Voyager and, most calamitous of all, FTX.

FTX’s failure is particularly concerning in that it provided loans to Voyager and BlockFi and bought assets from Three Arrows, only to suffer its own liquidity crunch based on exposure to its own FTT token and poor governance regarding links with sister company Alameda Research.

## FTX: behind the fall

On 10 November, FTX’s assets were frozen by its local Bahamian regulator, and it filed for bankruptcy protection in the US the following day. Its failure was allegedly caused in part by:

- Alameda’s very large holding of FTT tokens, issued by FTX
- Movement of client assets from FTX to Alameda to support proprietary trading
- The “complete failure” of corporate control and a “complete absence of trustworthy financial information”, according to John Ray III who took over as FTX CEO

## Green shoots

Amid all the debris of 2022, however, there are several green shoots among the broader marketplace.

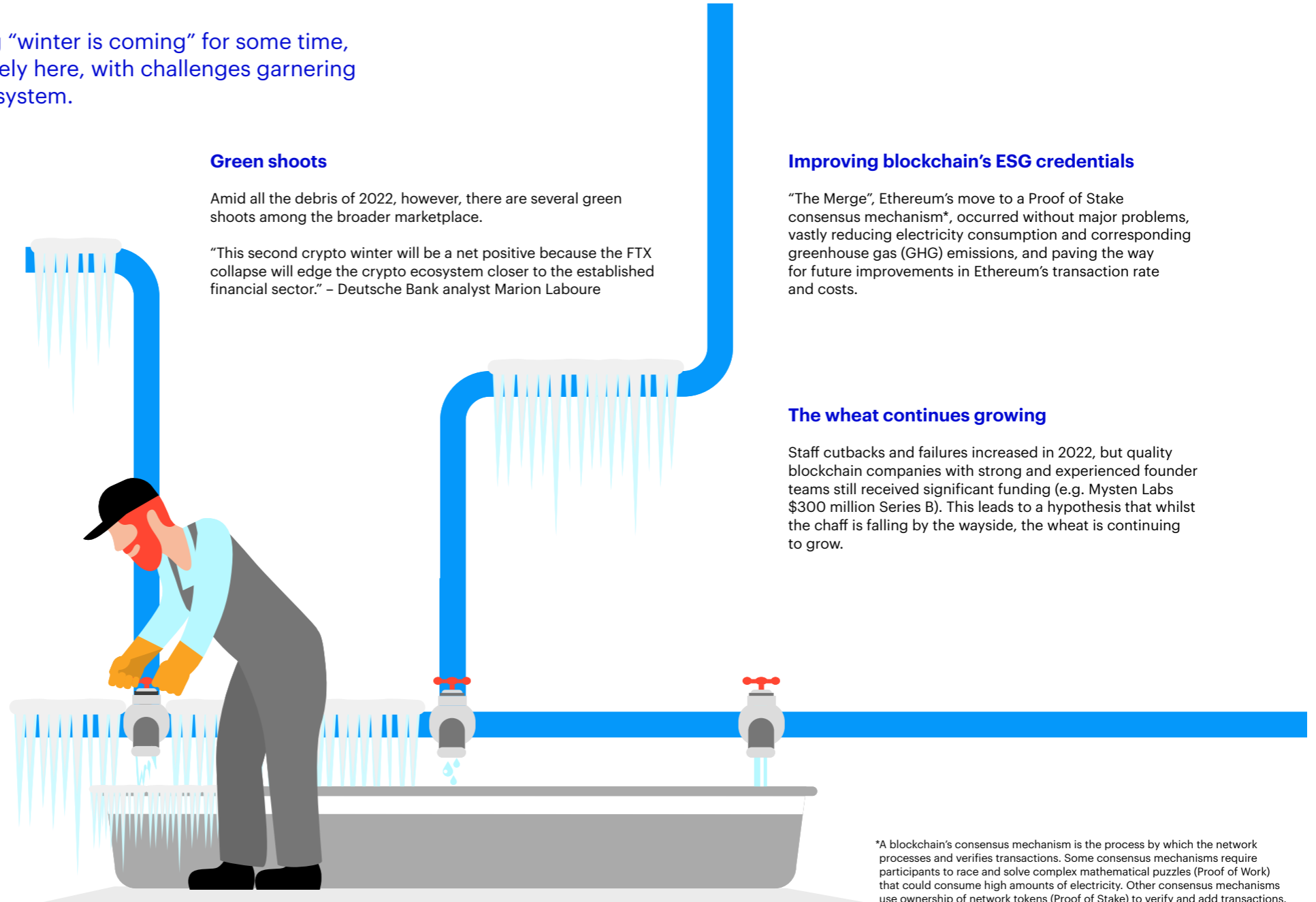
“This second crypto winter will be a net positive because the FTX collapse will edge the crypto ecosystem closer to the established financial sector.” – Deutsche Bank analyst Marion Laboure

## Improving blockchain’s ESG credentials

“The Merge”, Ethereum’s move to a Proof of Stake consensus mechanism\*, occurred without major problems, vastly reducing electricity consumption and corresponding greenhouse gas (GHG) emissions, and paving the way for future improvements in Ethereum’s transaction rate and costs.

## The wheat continues growing

Staff cutbacks and failures increased in 2022, but quality blockchain companies with strong and experienced founder teams still received significant funding (e.g. Mysten Labs \$300 million Series B). This leads to a hypothesis that whilst the chaff is falling by the wayside, the wheat is continuing to grow.

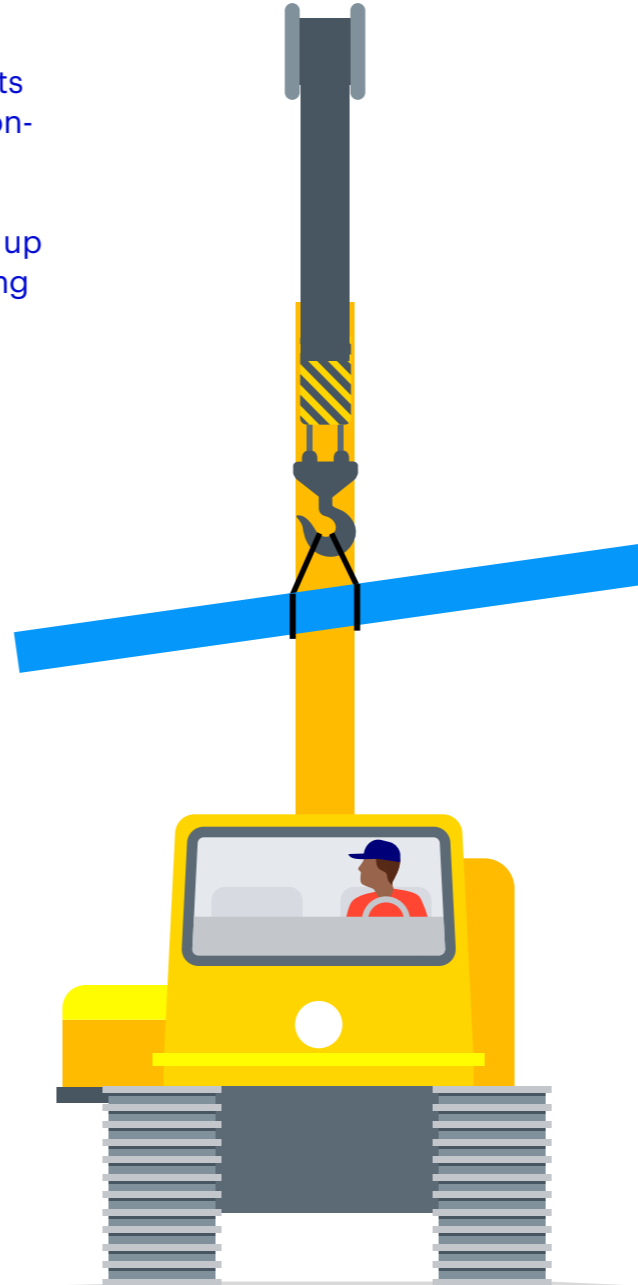


\*A blockchain’s consensus mechanism is the process by which the network processes and verifies transactions. Some consensus mechanisms require participants to race and solve complex mathematical puzzles (Proof of Work) that could consume high amounts of electricity. Other consensus mechanisms use ownership of network tokens (Proof of Stake) to verify and add transactions.

# Building during winter

Combined with the power of asset tokenisation, blockchain developments are paving the way for a gradual transition from the traditional information-based Web2 business model to a futuristic, value-based Web3 model – and with the addition of augmented reality / virtual reality (AR/VR) to the metaverse. Doubtless many exciting commercial opportunities will open up through the creation of new digitisation-enabled markets and the resulting programmability of asset classes, market infrastructures and money.

- The tokenisation of everything?
- Web3 and NFTs
- The metaverse



# The tokenisation of everything?

Tokenisation is extending beyond cryptocurrencies into all sorts of real-world assets, from bonds to fine wine.

## The potential of tokenisation

Tokenisation is a process for representing a real-world asset, such as a commercial office building, into a set of tokens that each represent ownership of a fraction of the asset. As a result, tokenisation facilitates ownership, with a potential increase in liquidity and a broadened ownership base for such high-value assets. A token can also be the asset itself, e.g. a bond might exist solely as a token on a blockchain, with all its characteristics captured in the token. Or the token can be a digital twin of a bond that exists in the real world outside of the blockchain.

## Tomorrow and beyond

Tokenisation has taken time to gain traction, but new initiatives are being launched continually. For example, UBS recently issued a CHF375 million tokenised digital bond on the blockchain-based platform of SIX's Digital Exchange (SDX) in addition to a listing on the traditional SIX Exchange.

ADDX – the Singapore-based digital exchange – recently launched tokens representing fine wine with an 8% hurdle rate (yield after fees) and an initial \$1 million of wine under management in the first year.

## Faster, better, stronger

Tokenisation also promises to greatly increase the efficiency of trading and settlement through the ability to simultaneously settle trades immediately after execution (i.e. atomic settlement through Delivery versus Payment (DvP) with tokenised cash), removing counterparty and settlement risk as a result. This is the model implemented by SDX mentioned above.

# Web3 and NFTs

## The future of the Internet?

The Web3 concept comes to life by comparing the non-fungible token (NFT) market with Web2 creator economies. NFTs sold on the Opensea platform are charged a 2.5% fee, a fraction of the 30% fee charged by Apple for its Appstore and 45% charged by YouTube. 22,400 creators earned an average of \$174,000 on Opensea vs a \$636 average for the 11 million artists on Spotify or \$2.47 average earnings for each of the 37 million channels on YouTube (source: A16Z).

## Deep dive into NFTs

A non-fungible token, or NFT, is a digital token associated with a blockchain (typically Ethereum) that indicates ownership of a unique digital asset. The NFT itself points to an address where the digital asset is stored, usually on a web server or on IPFS (Inter Planetary File System).

The NFT market hit a peak in Q1 2022 but has seen significant declines since. While most of the focus on NFTs has been around digital art, their utility extends to other digital assets such as video, music and in-game assets. Even in the current down market, Morgan Stanley identified in a November 2022 research report that: "Luxury-branded non-fungible tokens could become a \$56 billion market by 2030 and could see dramatically increased demand thanks to the metaverse. As a whole, NFTs could grow to a roughly \$240 billion market by 2030, with digital collectibles from luxury brands making up 8% of the space by that time."

## Gaming: not just fun and games

Electronic gaming has embraced the potential of Web3 and the metaverse. According to Blockchain Game Alliance, 20% of NFT sales volumes in 2021 were gaming-related assets, with 49% of crypto wallet activity coming from games.

NFTs and gaming are now two important drivers in the development of the metaverse.

# The metaverse

## From virtual assets to virtual worlds

Massive virtual worlds combined with new immersive access via augmented reality (AR), virtual reality (VR) and digital assets gives us the metaverse, or metaverses to be specific.

Precursors of the metaverse, such as Second Life in 2021, had a GDP of \$650 million, paying nearly \$80 million to creators and giving an indication of the potential size of the metaverse economy. Estimates for the metaverse in 2030 from McKinsey, Citibank and others average to about \$8 trillion. Digital assets in the metaverse can include NFTs representing artworks, music and other virtual assets, gaming assets, and digital twins of real world assets.

## Seeing double: digital twins

Utilising the metaverse to create digital twins of processes and systems can reduce the time taken for design and flush out subsequent potential production issues. For instance, Bentley Systems – a leading software provider for designing and maintaining infrastructure – utilises drones and digital twins to inspect bridges for maintenance (source: Invesco).

## Critical development choices

The metaverse economy's potential size raises questions about what kind of monetary system will sustain it. Potential solutions may include cryptoassets, stablecoins, traditional fiat or potentially Central Bank Digital Currency (CBDC).

While the use of CBDC in virtual worlds may seem fanciful, the Bank Of England commented in a blog: "The importance of cryptoassets in the open-metaverse means that if an open and decentralised metaverse grows, existing risks from cryptoassets may scale to have systemic financial stability consequences." Of course, one solution to mitigate the risk is CBDC.

# The tokenisation of everything?

Tokenisation is extending beyond cryptocurrencies into all sorts of real-world assets, from bonds to fine wine.

## The potential of tokenisation

Tokenisation is a process for representing a real-world asset, such as a commercial office building, into a set of tokens that each represent ownership of a fraction of the asset. As a result, tokenisation facilitates ownership, with a potential increase in liquidity and a broadened ownership base for such high-value assets. A token can also be the asset itself, e.g. a bond might exist solely as a token on a blockchain, with all its characteristics captured in the token. Or the token can be a digital twin of a bond that exists in the real world outside of the blockchain.

## Tomorrow and beyond

Tokenisation has taken time to gain traction, but new initiatives are being launched continually. For example, UBS recently issued a CHF375 million tokenised digital bond on the blockchain-based platform of SIX's Digital Exchange (SDX) in addition to a listing on the traditional SIX Exchange.

ADDX – the Singapore-based digital exchange – recently launched tokens representing fine wine with an 8% hurdle rate (yield after fees) and an initial \$1 million of wine under management in the first year.

## Faster, better, stronger

Tokenisation also promises to greatly increase the efficiency of trading and settlement through the ability to simultaneously settle trades immediately after execution (i.e. atomic settlement through Delivery versus Payment (DvP) with tokenised cash), removing counterparty and settlement risk as a result. This is the model implemented by SDX mentioned above.

# Web3 and NFTs

## The future of the Internet?

The Web3 concept comes to life by comparing the non-fungible token (NFT) market with Web2 creator economies. NFTs sold on the Opensea platform are charged a 2.5% fee, a fraction of the 30% fee charged by Apple for its Appstore and 45% charged by YouTube. 22,400 creators earned an average of \$174,000 on Opensea vs a \$636 average for the 11 million artists on Spotify or \$2.47 average earnings for each of the 37 million channels on YouTube (source: A16Z).

## Deep dive into NFTs

A non-fungible token, or NFT, is a digital token associated with a blockchain (typically Ethereum) that indicates ownership of a unique digital asset. The NFT itself points to an address where the digital asset is stored, usually on a web server or on IPFS (Inter Planetary File System).

The NFT market hit a peak in Q1 2022 but has seen significant declines since. While most of the focus on NFTs has been around digital art, their utility extends to other digital assets such as video, music and in-game assets. Even in the current down market, Morgan Stanley identified in a November 2022 research report that: "Luxury-branded non-fungible tokens could become a \$56 billion market by 2030 and could see dramatically increased demand thanks to the metaverse. As a whole, NFTs could grow to a roughly \$240 billion market by 2030, with digital collectibles from luxury brands making up 8% of the space by that time."

## Gaming: not just fun and games

Electronic gaming has embraced the potential of Web3 and the metaverse. According to Blockchain Game Alliance, 20% of NFT sales volumes in 2021 were gaming-related assets, with 49% of crypto wallet activity coming from games.

NFTs and gaming are now two important drivers in the development of the metaverse.

# The metaverse

## From virtual assets to virtual worlds

Massive virtual worlds combined with new immersive access via augmented reality (AR), virtual reality (VR) and digital assets gives us the metaverse, or metaverses to be specific.

Precursors of the metaverse, such as Second Life in 2021, had a GDP of \$650 million, paying nearly \$80 million to creators and giving an indication of the potential size of the metaverse economy. Estimates for the metaverse in 2030 from McKinsey, Citibank and others average to about \$8 trillion. Digital assets in the metaverse can include NFTs representing artworks, music and other virtual assets, gaming assets, and digital twins of real world assets.

## Seeing double: digital twins

Utilising the metaverse to create digital twins of processes and systems can reduce the time taken for design and flush out subsequent potential production issues. For instance, Bentley Systems – a leading software provider for designing and maintaining infrastructure – utilises drones and digital twins to inspect bridges for maintenance (source: Invesco).

## Critical development choices

The metaverse economy's potential size raises questions about what kind of monetary system will sustain it. Potential solutions may include cryptoassets, stablecoins, traditional fiat or potentially Central Bank Digital Currency (CBDC).

While the use of CBDC in virtual worlds may seem fanciful, the Bank Of England commented in a blog: "The importance of cryptoassets in the open-metaverse means that if an open and decentralised metaverse grows, existing risks from cryptoassets may scale to have systemic financial stability consequences." Of course, one solution to mitigate the risk is CBDC.

# The tokenisation of everything?

Tokenisation is extending beyond cryptocurrencies into all sorts of real-world assets, from bonds to fine wine.

## The potential of tokenisation

Tokenisation is a process for representing a real-world asset, such as a commercial office building, into a set of tokens that each represent ownership of a fraction of the asset. As a result, tokenisation facilitates ownership, with a potential increase in liquidity and a broadened ownership base for such high-value assets. A token can also be the asset itself, e.g. a bond might exist solely as a token on a blockchain, with all its characteristics captured in the token. Or the token can be a digital twin of a bond that exists in the real world outside of the blockchain.

## Tomorrow and beyond

Tokenisation has taken time to gain traction, but new initiatives are being launched continually. For example, UBS recently issued a CHF375 million tokenised digital bond on the blockchain-based platform of SIX's Digital Exchange (SDX) in addition to a listing on the traditional SIX Exchange.

ADDX – the Singapore-based digital exchange – recently launched tokens representing fine wine with an 8% hurdle rate (yield after fees) and an initial \$1 million of wine under management in the first year.

## Faster, better, stronger

Tokenisation also promises to greatly increase the efficiency of trading and settlement through the ability to simultaneously settle trades immediately after execution (i.e. atomic settlement through Delivery versus Payment (DvP) with tokenised cash), removing counterparty and settlement risk as a result. This is the model implemented by SDX mentioned above.

# Web3 and NFTs

## The future of the Internet?

The Web3 concept comes to life by comparing the non-fungible token (NFT) market with Web2 creator economies. NFTs sold on the Opensea platform are charged a 2.5% fee, a fraction of the 30% fee charged by Apple for its Appstore and 45% charged by YouTube. 22,400 creators earned an average of \$174,000 on Opensea vs a \$636 average for the 11 million artists on Spotify or \$2.47 average earnings for each of the 37 million channels on YouTube (source: A16Z).

## Deep dive into NFTs

A non-fungible token, or NFT, is a digital token associated with a blockchain (typically Ethereum) that indicates ownership of a unique digital asset. The NFT itself points to an address where the digital asset is stored, usually on a web server or on IPFS (Inter Planetary File System).

The NFT market hit a peak in Q1 2022 but has seen significant declines since. While most of the focus on NFTs has been around digital art, their utility extends to other digital assets such as video, music and in-game assets. Even in the current down market, Morgan Stanley identified in a November 2022 research report that: "Luxury-branded non-fungible tokens could become a \$56 billion market by 2030 and could see dramatically increased demand thanks to the metaverse. As a whole, NFTs could grow to a roughly \$240 billion market by 2030, with digital collectibles from luxury brands making up 8% of the space by that time."

## Gaming: not just fun and games

Electronic gaming has embraced the potential of Web3 and the metaverse. According to Blockchain Game Alliance, 20% of NFT sales volumes in 2021 were gaming-related assets, with 49% of crypto wallet activity coming from games.

NFTs and gaming are now two important drivers in the development of the metaverse.

# The metaverse

## From virtual assets to virtual worlds

Massive virtual worlds combined with new immersive access via augmented reality (AR), virtual reality (VR) and digital assets gives us the metaverse, or metaverses to be specific.

Precursors of the metaverse, such as Second Life in 2021, had a GDP of \$650 million, paying nearly \$80 million to creators and giving an indication of the potential size of the metaverse economy. Estimates for the metaverse in 2030 from McKinsey, Citibank and others average to about \$8 trillion. Digital assets in the metaverse can include NFTs representing artworks, music and other virtual assets, gaming assets, and digital twins of real world assets.

## Seeing double: digital twins

Utilising the metaverse to create digital twins of processes and systems can reduce the time taken for design and flush out subsequent potential production issues. For instance, Bentley Systems – a leading software provider for designing and maintaining infrastructure – utilises drones and digital twins to inspect bridges for maintenance (source: Invesco).

## Critical development choices

The metaverse economy's potential size raises questions about what kind of monetary system will sustain it. Potential solutions may include cryptoassets, stablecoins, traditional fiat or potentially Central Bank Digital Currency (CBDC).

While the use of CBDC in virtual worlds may seem fanciful, the Bank Of England commented in a blog: "The importance of cryptoassets in the open-metaverse means that if an open and decentralised metaverse grows, existing risks from cryptoassets may scale to have systemic financial stability consequences." Of course, one solution to mitigate the risk is CBDC.

# The tokenisation of everything?

Tokenisation is extending beyond cryptocurrencies into all sorts of real-world assets, from bonds to fine wine.

## The potential of tokenisation

Tokenisation is a process for representing a real-world asset, such as a commercial office building, into a set of tokens that each represent ownership of a fraction of the asset. As a result, tokenisation facilitates ownership, with a potential increase in liquidity and a broadened ownership base for such high-value assets. A token can also be the asset itself, e.g. a bond might exist solely as a token on a blockchain, with all its characteristics captured in the token. Or the token can be a digital twin of a bond that exists in the real world outside of the blockchain.

## Tomorrow and beyond

Tokenisation has taken time to gain traction, but new initiatives are being launched continually. For example, UBS recently issued a CHF375 million tokenised digital bond on the blockchain-based platform of SIX's Digital Exchange (SDX) in addition to a listing on the traditional SIX Exchange.

ADDX – the Singapore-based digital exchange – recently launched tokens representing fine wine with an 8% hurdle rate (yield after fees) and an initial \$1 million of wine under management in the first year.

## Faster, better, stronger

Tokenisation also promises to greatly increase the efficiency of trading and settlement through the ability to simultaneously settle trades immediately after execution (i.e. atomic settlement through Delivery versus Payment (DvP) with tokenised cash), removing counterparty and settlement risk as a result. This is the model implemented by SDX mentioned above.

# Web3 and NFTs

## The future of the Internet?

The Web3 concept comes to life by comparing the non-fungible token (NFT) market with Web2 creator economies. NFTs sold on the Opensea platform are charged a 2.5% fee, a fraction of the 30% fee charged by Apple for its Appstore and 45% charged by YouTube. 22,400 creators earned an average of \$174,000 on Opensea vs a \$636 average for the 11 million artists on Spotify or \$2.47 average earnings for each of the 37 million channels on YouTube (source: A16Z).

## Deep dive into NFTs

A non-fungible token, or NFT, is a digital token associated with a blockchain (typically Ethereum) that indicates ownership of a unique digital asset. The NFT itself points to an address where the digital asset is stored, usually on a web server or on IPFS (Inter Planetary File System).

The NFT market hit a peak in Q1 2022 but has seen significant declines since. While most of the focus on NFTs has been around digital art, their utility extends to other digital assets such as video, music and in-game assets. Even in the current down market, Morgan Stanley identified in a November 2022 research report that: "Luxury-branded non-fungible tokens could become a \$56 billion market by 2030 and could see dramatically increased demand thanks to the metaverse. As a whole, NFTs could grow to a roughly \$240 billion market by 2030, with digital collectibles from luxury brands making up 8% of the space by that time."

## Gaming: not just fun and games

Electronic gaming has embraced the potential of Web3 and the metaverse. According to Blockchain Game Alliance, 20% of NFT sales volumes in 2021 were gaming-related assets, with 49% of crypto wallet activity coming from games.

NFTs and gaming are now two important drivers in the development of the metaverse.

# The metaverse

## From virtual assets to virtual worlds

Massive virtual worlds combined with new immersive access via augmented reality (AR), virtual reality (VR) and digital assets gives us the metaverse, or metaverses to be specific.

Precursors of the metaverse, such as Second Life in 2021, had a GDP of \$650 million, paying nearly \$80 million to creators and giving an indication of the potential size of the metaverse economy. Estimates for the metaverse in 2030 from McKinsey, Citibank and others average to about \$8 trillion. Digital assets in the metaverse can include NFTs representing artworks, music and other virtual assets, gaming assets, and digital twins of real world assets.

## Seeing double: digital twins

Utilising the metaverse to create digital twins of processes and systems can reduce the time taken for design and flush out subsequent potential production issues. For instance, Bentley Systems – a leading software provider for designing and maintaining infrastructure – utilises drones and digital twins to inspect bridges for maintenance (source: Invesco).

## Critical development choices

The metaverse economy's potential size raises questions about what kind of monetary system will sustain it. Potential solutions may include cryptoassets, stablecoins, traditional fiat or potentially Central Bank Digital Currency (CBDC).

While the use of CBDC in virtual worlds may seem fanciful, the Bank Of England commented in a blog: "The importance of cryptoassets in the open-metaverse means that if an open and decentralised metaverse grows, existing risks from cryptoassets may scale to have systemic financial stability consequences." Of course, one solution to mitigate the risk is CBDC.

# The tokenisation of everything?

Tokenisation is extending beyond cryptocurrencies into all sorts of real-world assets, from bonds to fine wine.

## The potential of tokenisation

Tokenisation is a process for representing a real-world asset, such as a commercial office building, into a set of tokens that each represent ownership of a fraction of the asset. As a result, tokenisation facilitates ownership, with a potential increase in liquidity and a broadened ownership base for such high-value assets. A token can also be the asset itself, e.g. a bond might exist solely as a token on a blockchain, with all its characteristics captured in the token. Or the token can be a digital twin of a bond that exists in the real world outside of the blockchain.

## Tomorrow and beyond

Tokenisation has taken time to gain traction, but new initiatives are being launched continually. For example, UBS recently issued a CHF375 million tokenised digital bond on the blockchain-based platform of SIX's Digital Exchange (SDX) in addition to a listing on the traditional SIX Exchange.

ADDX – the Singapore-based digital exchange – recently launched tokens representing fine wine with an 8% hurdle rate (yield after fees) and an initial \$1 million of wine under management in the first year.

## Faster, better, stronger

Tokenisation also promises to greatly increase the efficiency of trading and settlement through the ability to simultaneously settle trades immediately after execution (i.e. atomic settlement through Delivery versus Payment (DvP) with tokenised cash), removing counterparty and settlement risk as a result. This is the model implemented by SDX mentioned above.

# Web3 and NFTs

## The future of the Internet?

The Web3 concept comes to life by comparing the non-fungible token (NFT) market with Web2 creator economies. NFTs sold on the Opensea platform are charged a 2.5% fee, a fraction of the 30% fee charged by Apple for its Appstore and 45% charged by YouTube. 22,400 creators earned an average of \$174,000 on Opensea vs a \$636 average for the 11 million artists on Spotify or \$2.47 average earnings for each of the 37 million channels on YouTube (source: A16Z).

## Deep dive into NFTs

A non-fungible token, or NFT, is a digital token associated with a blockchain (typically Ethereum) that indicates ownership of a unique digital asset. The NFT itself points to an address where the digital asset is stored, usually on a web server or on IPFS (Inter Planetary File System).

The NFT market hit a peak in Q1 2022 but has seen significant declines since. While most of the focus on NFTs has been around digital art, their utility extends to other digital assets such as video, music and in-game assets. Even in the current down market, Morgan Stanley identified in a November 2022 research report that: "Luxury-branded non-fungible tokens could become a \$56 billion market by 2030 and could see dramatically increased demand thanks to the metaverse. As a whole, NFTs could grow to a roughly \$240 billion market by 2030, with digital collectibles from luxury brands making up 8% of the space by that time."

## Gaming: not just fun and games

Electronic gaming has embraced the potential of Web3 and the metaverse. According to Blockchain Game Alliance, 20% of NFT sales volumes in 2021 were gaming-related assets, with 49% of crypto wallet activity coming from games.

NFTs and gaming are now two important drivers in the development of the metaverse.

# The metaverse

## From virtual assets to virtual worlds

Massive virtual worlds combined with new immersive access via augmented reality (AR), virtual reality (VR) and digital assets gives us the metaverse, or metaverses to be specific.

Precursors of the metaverse, such as Second Life in 2021, had a GDP of \$650 million, paying nearly \$80 million to creators and giving an indication of the potential size of the metaverse economy. Estimates for the metaverse in 2030 from McKinsey, Citibank and others average to about \$8 trillion. Digital assets in the metaverse can include NFTs representing artworks, music and other virtual assets, gaming assets, and digital twins of real world assets.

## Seeing double: digital twins

Utilising the metaverse to create digital twins of processes and systems can reduce the time taken for design and flush out subsequent potential production issues. For instance, Bentley Systems – a leading software provider for designing and maintaining infrastructure – utilises drones and digital twins to inspect bridges for maintenance (source: Invesco).

## Critical development choices

The metaverse economy's potential size raises questions about what kind of monetary system will sustain it. Potential solutions may include cryptoassets, stablecoins, traditional fiat or potentially Central Bank Digital Currency (CBDC).

While the use of CBDC in virtual worlds may seem fanciful, the Bank Of England commented in a blog: "The importance of cryptoassets in the open-metaverse means that if an open and decentralised metaverse grows, existing risks from cryptoassets may scale to have systemic financial stability consequences." Of course, one solution to mitigate the risk is CBDC.



# The tokenisation of everything?

Tokenisation is extending beyond cryptocurrencies into all sorts of real-world assets, from bonds to fine wine.

## The potential of tokenisation

Tokenisation is a process for representing a real-world asset, such as a commercial office building, into a set of tokens that each represent ownership of a fraction of the asset. As a result, tokenisation facilitates ownership, with a potential increase in liquidity and a broadened ownership base for such high-value assets. A token can also be the asset itself, e.g. a bond might exist solely as a token on a blockchain, with all its characteristics captured in the token. Or the token can be a digital twin of a bond that exists in the real world outside of the blockchain.

## Tomorrow and beyond

Tokenisation has taken time to gain traction, but new initiatives are being launched continually. For example, UBS recently issued a CHF375 million tokenised digital bond on the blockchain-based platform of SIX's Digital Exchange (SDX) in addition to a listing on the traditional SIX Exchange.

ADDX – the Singapore-based digital exchange – recently launched tokens representing fine wine with an 8% hurdle rate (yield after fees) and an initial \$1 million of wine under management in the first year.

## Faster, better, stronger

Tokenisation also promises to greatly increase the efficiency of trading and settlement through the ability to simultaneously settle trades immediately after execution (i.e. atomic settlement through Delivery versus Payment (DvP) with tokenised cash), removing counterparty and settlement risk as a result. This is the model implemented by SDX mentioned above.

# Web3 and NFTs

## The future of the Internet?

The Web3 concept comes to life by comparing the non-fungible token (NFT) market with Web2 creator economies. NFTs sold on the Opensea platform are charged a 2.5% fee, a fraction of the 30% fee charged by Apple for its Appstore and 45% charged by YouTube. 22,400 creators earned an average of \$174,000 on Opensea vs a \$636 average for the 11 million artists on Spotify or \$2.47 average earnings for each of the 37 million channels on YouTube (source: A16Z).

## Deep dive into NFTs

A non-fungible token, or NFT, is a digital token associated with a blockchain (typically Ethereum) that indicates ownership of a unique digital asset. The NFT itself points to an address where the digital asset is stored, usually on a web server or on IPFS (Inter Planetary File System).

The NFT market hit a peak in Q1 2022 but has seen significant declines since. While most of the focus on NFTs has been around digital art, their utility extends to other digital assets such as video, music and in-game assets. Even in the current down market, Morgan Stanley identified in a November 2022 research report that: "Luxury-branded non-fungible tokens could become a \$56 billion market by 2030 and could see dramatically increased demand thanks to the metaverse. As a whole, NFTs could grow to a roughly \$240 billion market by 2030, with digital collectibles from luxury brands making up 8% of the space by that time."

## Gaming: not just fun and games

Electronic gaming has embraced the potential of Web3 and the metaverse. According to Blockchain Game Alliance, 20% of NFT sales volumes in 2021 were gaming-related assets, with 49% of crypto wallet activity coming from games.

NFTs and gaming are now two important drivers in the development of the metaverse.

# The metaverse

## From virtual assets to virtual worlds

Massive virtual worlds combined with new immersive access via augmented reality (AR), virtual reality (VR) and digital assets gives us the metaverse, or metaverses to be specific.

Precursors of the metaverse, such as Second Life in 2021, had a GDP of \$650 million, paying nearly \$80 million to creators and giving an indication of the potential size of the metaverse economy. Estimates for the metaverse in 2030 from McKinsey, Citibank and others average to about \$8 trillion. Digital assets in the metaverse can include NFTs representing artworks, music and other virtual assets, gaming assets, and digital twins of real world assets.

## Seeing double: digital twins

Utilising the metaverse to create digital twins of processes and systems can reduce the time taken for design and flush out subsequent potential production issues. For instance, Bentley Systems – a leading software provider for designing and maintaining infrastructure – utilises drones and digital twins to inspect bridges for maintenance (source: Invesco).

## Critical development choices

The metaverse economy's potential size raises questions about what kind of monetary system will sustain it. Potential solutions may include cryptoassets, stablecoins, traditional fiat or potentially Central Bank Digital Currency (CBDC).

While the use of CBDC in virtual worlds may seem fanciful, the Bank Of England commented in a blog: "The importance of cryptoassets in the open-metaverse means that if an open and decentralised metaverse grows, existing risks from cryptoassets may scale to have systemic financial stability consequences." Of course, one solution to mitigate the risk is CBDC.

# The tokenisation of everything?

Tokenisation is extending beyond cryptocurrencies into all sorts of real-world assets, from bonds to fine wine.

## The potential of tokenisation

Tokenisation is a process for representing a real-world asset, such as a commercial office building, into a set of tokens that each represent ownership of a fraction of the asset. As a result, tokenisation facilitates ownership, with a potential increase in liquidity and a broadened ownership base for such high-value assets. A token can also be the asset itself, e.g. a bond might exist solely as a token on a blockchain, with all its characteristics captured in the token. Or the token can be a digital twin of a bond that exists in the real world outside of the blockchain.

## Tomorrow and beyond

Tokenisation has taken time to gain traction, but new initiatives are being launched continually. For example, UBS recently issued a CHF375 million tokenised digital bond on the blockchain-based platform of SIX's Digital Exchange (SDX) in addition to a listing on the traditional SIX Exchange.

ADDX – the Singapore-based digital exchange – recently launched tokens representing fine wine with an 8% hurdle rate (yield after fees) and an initial \$1 million of wine under management in the first year.

## Faster, better, stronger

Tokenisation also promises to greatly increase the efficiency of trading and settlement through the ability to simultaneously settle trades immediately after execution (i.e. atomic settlement through Delivery versus Payment (DvP) with tokenised cash), removing counterparty and settlement risk as a result. This is the model implemented by SDX mentioned above.

# Web3 and NFTs

## The future of the Internet?

The Web3 concept comes to life by comparing the non-fungible token (NFT) market with Web2 creator economies. NFTs sold on the Opensea platform are charged a 2.5% fee, a fraction of the 30% fee charged by Apple for its Appstore and 45% charged by YouTube. 22,400 creators earned an average of \$174,000 on Opensea vs a \$636 average for the 11 million artists on Spotify or \$2.47 average earnings for each of the 37 million channels on YouTube (source: A16Z).

## Deep dive into NFTs

A non-fungible token, or NFT, is a digital token associated with a blockchain (typically Ethereum) that indicates ownership of a unique digital asset. The NFT itself points to an address where the digital asset is stored, usually on a web server or on IPFS (Inter Planetary File System).

The NFT market hit a peak in Q1 2022 but has seen significant declines since. While most of the focus on NFTs has been around digital art, their utility extends to other digital assets such as video, music and in-game assets. Even in the current down market, Morgan Stanley identified in a November 2022 research report that: "Luxury-branded non-fungible tokens could become a \$56 billion market by 2030 and could see dramatically increased demand thanks to the metaverse. As a whole, NFTs could grow to a roughly \$240 billion market by 2030, with digital collectibles from luxury brands making up 8% of the space by that time."

## Gaming: not just fun and games

Electronic gaming has embraced the potential of Web3 and the metaverse. According to Blockchain Game Alliance, 20% of NFT sales volumes in 2021 were gaming-related assets, with 49% of crypto wallet activity coming from games.

NFTs and gaming are now two important drivers in the development of the metaverse.

# The metaverse

## From virtual assets to virtual worlds

Massive virtual worlds combined with new immersive access via augmented reality (AR), virtual reality (VR) and digital assets gives us the metaverse, or metaverses to be specific.

Precursors of the metaverse, such as Second Life in 2021, had a GDP of \$650 million, paying nearly \$80 million to creators and giving an indication of the potential size of the metaverse economy. Estimates for the metaverse in 2030 from McKinsey, Citibank and others average to about \$8 trillion. Digital assets in the metaverse can include NFTs representing artworks, music and other virtual assets, gaming assets, and digital twins of real world assets.

## Seeing double: digital twins

Utilising the metaverse to create digital twins of processes and systems can reduce the time taken for design and flush out subsequent potential production issues. For instance, Bentley Systems – a leading software provider for designing and maintaining infrastructure – utilises drones and digital twins to inspect bridges for maintenance (source: Invesco).

## Critical development choices

The metaverse economy's potential size raises questions about what kind of monetary system will sustain it. Potential solutions may include cryptoassets, stablecoins, traditional fiat or potentially Central Bank Digital Currency (CBDC).

While the use of CBDC in virtual worlds may seem fanciful, the Bank Of England commented in a blog: "The importance of cryptoassets in the open-metaverse means that if an open and decentralised metaverse grows, existing risks from cryptoassets may scale to have systemic financial stability consequences." Of course, one solution to mitigate the risk is CBDC.

# The tokenisation of everything?

Tokenisation is extending beyond cryptocurrencies into all sorts of real-world assets, from bonds to fine wine.

## The potential of tokenisation

Tokenisation is a process for representing a real-world asset, such as a commercial office building, into a set of tokens that each represent ownership of a fraction of the asset. As a result, tokenisation facilitates ownership, with a potential increase in liquidity and a broadened ownership base for such high-value assets. A token can also be the asset itself, e.g. a bond might exist solely as a token on a blockchain, with all its characteristics captured in the token. Or the token can be a digital twin of a bond that exists in the real world outside of the blockchain.

## Tomorrow and beyond

Tokenisation has taken time to gain traction, but new initiatives are being launched continually. For example, UBS recently issued a CHF375 million tokenised digital bond on the blockchain-based platform of SIX's Digital Exchange (SDX) in addition to a listing on the traditional SIX Exchange.

ADDX – the Singapore-based digital exchange – recently launched tokens representing fine wine with an 8% hurdle rate (yield after fees) and an initial \$1 million of wine under management in the first year.

## Faster, better, stronger

Tokenisation also promises to greatly increase the efficiency of trading and settlement through the ability to simultaneously settle trades immediately after execution (i.e. atomic settlement through Delivery versus Payment (DvP) with tokenised cash), removing counterparty and settlement risk as a result. This is the model implemented by SDX mentioned above.

# Web3 and NFTs

## The future of the Internet?

The Web3 concept comes to life by comparing the non-fungible token (NFT) market with Web2 creator economies. NFTs sold on the Opensea platform are charged a 2.5% fee, a fraction of the 30% fee charged by Apple for its Appstore and 45% charged by YouTube. 22,400 creators earned an average of \$174,000 on Opensea vs a \$636 average for the 11 million artists on Spotify or \$2.47 average earnings for each of the 37 million channels on YouTube (source: A16Z).

## Deep dive into NFTs

A non-fungible token, or NFT, is a digital token associated with a blockchain (typically Ethereum) that indicates ownership of a unique digital asset. The NFT itself points to an address where the digital asset is stored, usually on a web server or on IPFS (Inter Planetary File System).

The NFT market hit a peak in Q1 2022 but has seen significant declines since. While most of the focus on NFTs has been around digital art, their utility extends to other digital assets such as video, music and in-game assets. Even in the current down market, Morgan Stanley identified in a November 2022 research report that: "Luxury-branded non-fungible tokens could become a \$56 billion market by 2030 and could see dramatically increased demand thanks to the metaverse. As a whole, NFTs could grow to a roughly \$240 billion market by 2030, with digital collectibles from luxury brands making up 8% of the space by that time."

## Gaming: not just fun and games

Electronic gaming has embraced the potential of Web3 and the metaverse. According to Blockchain Game Alliance, 20% of NFT sales volumes in 2021 were gaming-related assets, with 49% of crypto wallet activity coming from games.

NFTs and gaming are now two important drivers in the development of the metaverse.

# The metaverse

## From virtual assets to virtual worlds

Massive virtual worlds combined with new immersive access via augmented reality (AR), virtual reality (VR) and digital assets gives us the metaverse, or metaverses to be specific.

Precursors of the metaverse, such as Second Life in 2021, had a GDP of \$650 million, paying nearly \$80 million to creators and giving an indication of the potential size of the metaverse economy. Estimates for the metaverse in 2030 from McKinsey, Citibank and others average to about \$8 trillion. Digital assets in the metaverse can include NFTs representing artworks, music and other virtual assets, gaming assets, and digital twins of real world assets.

## Seeing double: digital twins

Utilising the metaverse to create digital twins of processes and systems can reduce the time taken for design and flush out subsequent potential production issues. For instance, Bentley Systems – a leading software provider for designing and maintaining infrastructure – utilises drones and digital twins to inspect bridges for maintenance (source: Invesco).

## Critical development choices

The metaverse economy's potential size raises questions about what kind of monetary system will sustain it. Potential solutions may include cryptoassets, stablecoins, traditional fiat or potentially Central Bank Digital Currency (CBDC).

While the use of CBDC in virtual worlds may seem fanciful, the Bank Of England commented in a blog: "The importance of cryptoassets in the open-metaverse means that if an open and decentralised metaverse grows, existing risks from cryptoassets may scale to have systemic financial stability consequences." Of course, one solution to mitigate the risk is CBDC.

# The tokenisation of everything?

Tokenisation is extending beyond cryptocurrencies into all sorts of real-world assets, from bonds to fine wine.

## The potential of tokenisation

Tokenisation is a process for representing a real-world asset, such as a commercial office building, into a set of tokens that each represent ownership of a fraction of the asset. As a result, tokenisation facilitates ownership, with a potential increase in liquidity and a broadened ownership base for such high-value assets. A token can also be the asset itself, e.g. a bond might exist solely as a token on a blockchain, with all its characteristics captured in the token. Or the token can be a digital twin of a bond that exists in the real world outside of the blockchain.

## Tomorrow and beyond

Tokenisation has taken time to gain traction, but new initiatives are being launched continually. For example, UBS recently issued a CHF375 million tokenised digital bond on the blockchain-based platform of SIX's Digital Exchange (SDX) in addition to a listing on the traditional SIX Exchange.

ADDX – the Singapore-based digital exchange – recently launched tokens representing fine wine with an 8% hurdle rate (yield after fees) and an initial \$1 million of wine under management in the first year.

## Faster, better, stronger

Tokenisation also promises to greatly increase the efficiency of trading and settlement through the ability to simultaneously settle trades immediately after execution (i.e. atomic settlement through Delivery versus Payment (DvP) with tokenised cash), removing counterparty and settlement risk as a result. This is the model implemented by SDX mentioned above.

# Web3 and NFTs

## The future of the Internet?

The Web3 concept comes to life by comparing the non-fungible token (NFT) market with Web2 creator economies. NFTs sold on the Opensea platform are charged a 2.5% fee, a fraction of the 30% fee charged by Apple for its Appstore and 45% charged by YouTube. 22,400 creators earned an average of \$174,000 on Opensea vs a \$636 average for the 11 million artists on Spotify or \$2.47 average earnings for each of the 37 million channels on YouTube (source: A16Z).

## Deep dive into NFTs

A non-fungible token, or NFT, is a digital token associated with a blockchain (typically Ethereum) that indicates ownership of a unique digital asset. The NFT itself points to an address where the digital asset is stored, usually on a web server or on IPFS (Inter Planetary File System).

The NFT market hit a peak in Q1 2022 but has seen significant declines since. While most of the focus on NFTs has been around digital art, their utility extends to other digital assets such as video, music and in-game assets. Even in the current down market, Morgan Stanley identified in a November 2022 research report that: "Luxury-branded non-fungible tokens could become a \$56 billion market by 2030 and could see dramatically increased demand thanks to the metaverse. As a whole, NFTs could grow to a roughly \$240 billion market by 2030, with digital collectibles from luxury brands making up 8% of the space by that time."

## Gaming: not just fun and games

Electronic gaming has embraced the potential of Web3 and the metaverse. According to Blockchain Game Alliance, 20% of NFT sales volumes in 2021 were gaming-related assets, with 49% of crypto wallet activity coming from games.

NFTs and gaming are now two important drivers in the development of the metaverse.

# The metaverse

## From virtual assets to virtual worlds

Massive virtual worlds combined with new immersive access via augmented reality (AR), virtual reality (VR) and digital assets gives us the metaverse, or metaverses to be specific.

Precursors of the metaverse, such as Second Life in 2021, had a GDP of \$650 million, paying nearly \$80 million to creators and giving an indication of the potential size of the metaverse economy. Estimates for the metaverse in 2030 from McKinsey, Citibank and others average to about \$8 trillion. Digital assets in the metaverse can include NFTs representing artworks, music and other virtual assets, gaming assets, and digital twins of real world assets.

## Seeing double: digital twins

Utilising the metaverse to create digital twins of processes and systems can reduce the time taken for design and flush out subsequent potential production issues. For instance, Bentley Systems – a leading software provider for designing and maintaining infrastructure – utilises drones and digital twins to inspect bridges for maintenance (source: Invesco).

## Critical development choices

The metaverse economy's potential size raises questions about what kind of monetary system will sustain it. Potential solutions may include cryptoassets, stablecoins, traditional fiat or potentially Central Bank Digital Currency (CBDC).

While the use of CBDC in virtual worlds may seem fanciful, the Bank Of England commented in a blog: "The importance of cryptoassets in the open-metaverse means that if an open and decentralised metaverse grows, existing risks from cryptoassets may scale to have systemic financial stability consequences." Of course, one solution to mitigate the risk is CBDC.

# The case for regulation

Regulation struggles to keep up with the pace of blockchain innovation, but recent failures clearly illustrate the need for increased and effective regulation to carry over some proven safeguards from traditional finance, but without stifling digital assets' innovation.

## Winter clouds, silver linings: the appetite for regulation

FTX's failure illustrates the risks that consumers face, as well as the stability of the broader crypto industry from the lack of transparency on proof of reserves, effective management of liquidity risks, separation of functions, and supervision across all these areas.

Parts of the blockchain industry have pushed back against regulation previously, but many more now recognise the need. According to Changpeng Zhao, CEO of Binance: "We do need some regulations, we do need to do this properly, we do need to do this in a stable way." Even so, challenges for regulating cryptocurrencies are significant.

## EU regulation

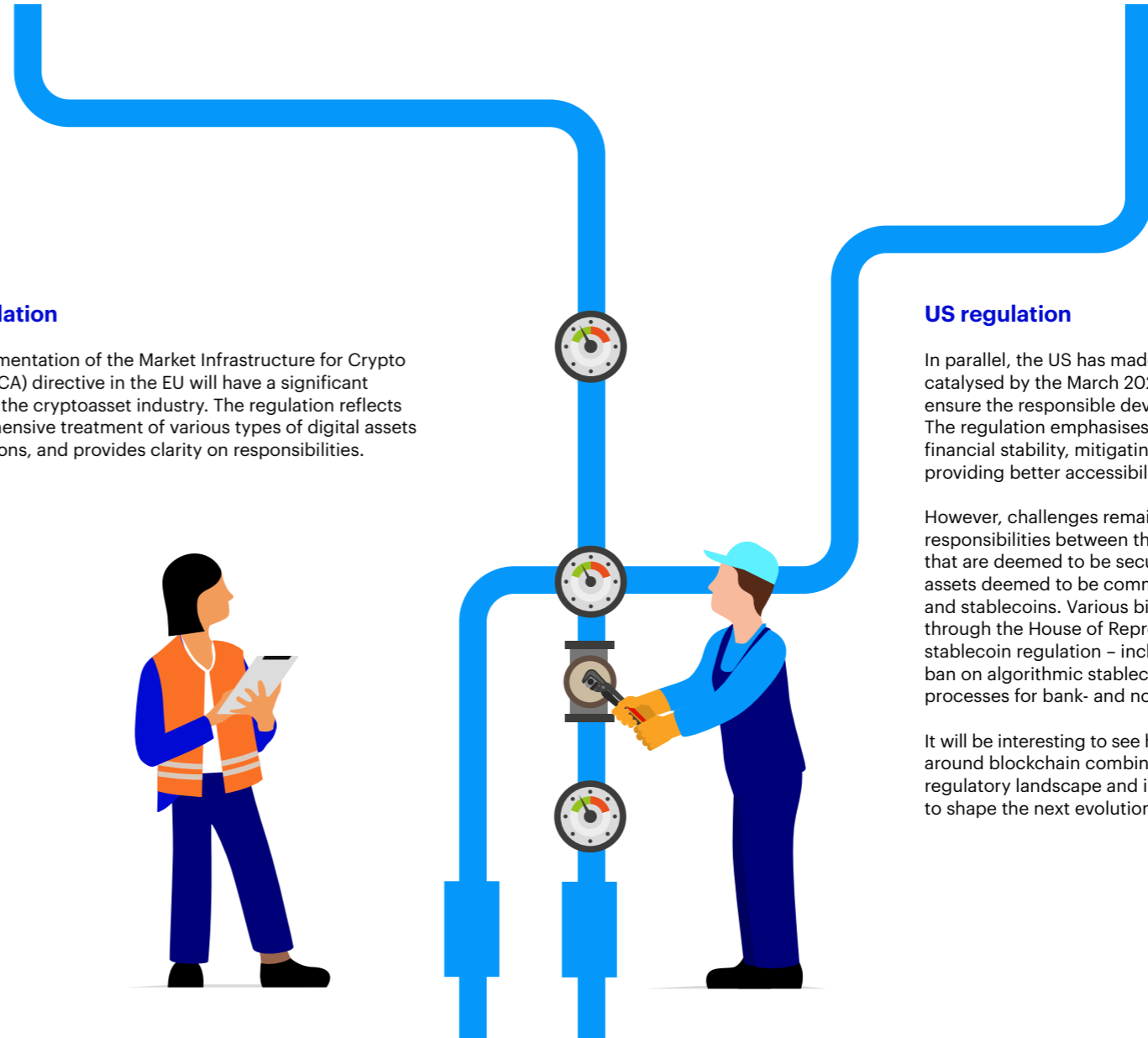
The implementation of the Market Infrastructure for Crypto Assets (MiCA) directive in the EU will have a significant impact on the cryptoasset industry. The regulation reflects a comprehensive treatment of various types of digital assets and functions, and provides clarity on responsibilities.

## US regulation

In parallel, the US has made progress on regulation, catalysed by the March 2020 Executive Order to ensure the responsible development of cryptoassets. The regulation emphasises protecting consumers, financial stability, mitigating illicit finance and providing better accessibility to financial services.

However, challenges remain in delegating responsibilities between the SEC (those cryptoassets that are deemed to be securities), the CFTC (those assets deemed to be commodities or derivatives) and stablecoins. Various bills continue to proceed through the House of Representatives, particularly stablecoin regulation – including a proposed one-year ban on algorithmic stablecoins – and new approval processes for bank- and non-bank-issued stablecoins.

It will be interesting to see how the key considerations around blockchain combine with the evolving regulatory landscape and investor sentiment to shape the next evolution of digital asset markets.



# The case for regulation

Regulation struggles to keep up with the pace of blockchain innovation, but recent failures clearly illustrate the need for increased and effective regulation to carry over some proven safeguards from traditional finance, but without stifling digital assets' innovation.

## Winter clouds, silver linings: the appetite for regulation

FTX's failure illustrates the risks that consumers face, as well as the stability of the broader crypto industry from the lack of transparency on proof of reserves, effective management of liquidity risks, separation of functions, and supervision across all these areas.

Parts of the blockchain industry have pushed back against regulation previously, but many more now recognise the need. According to Changpeng Zhao, CEO of Binance: "We do need some regulations, we do need to do this properly, we do need to do this in a stable way." Even so, challenges for regulating cryptocurrencies are significant.

## EU regulation

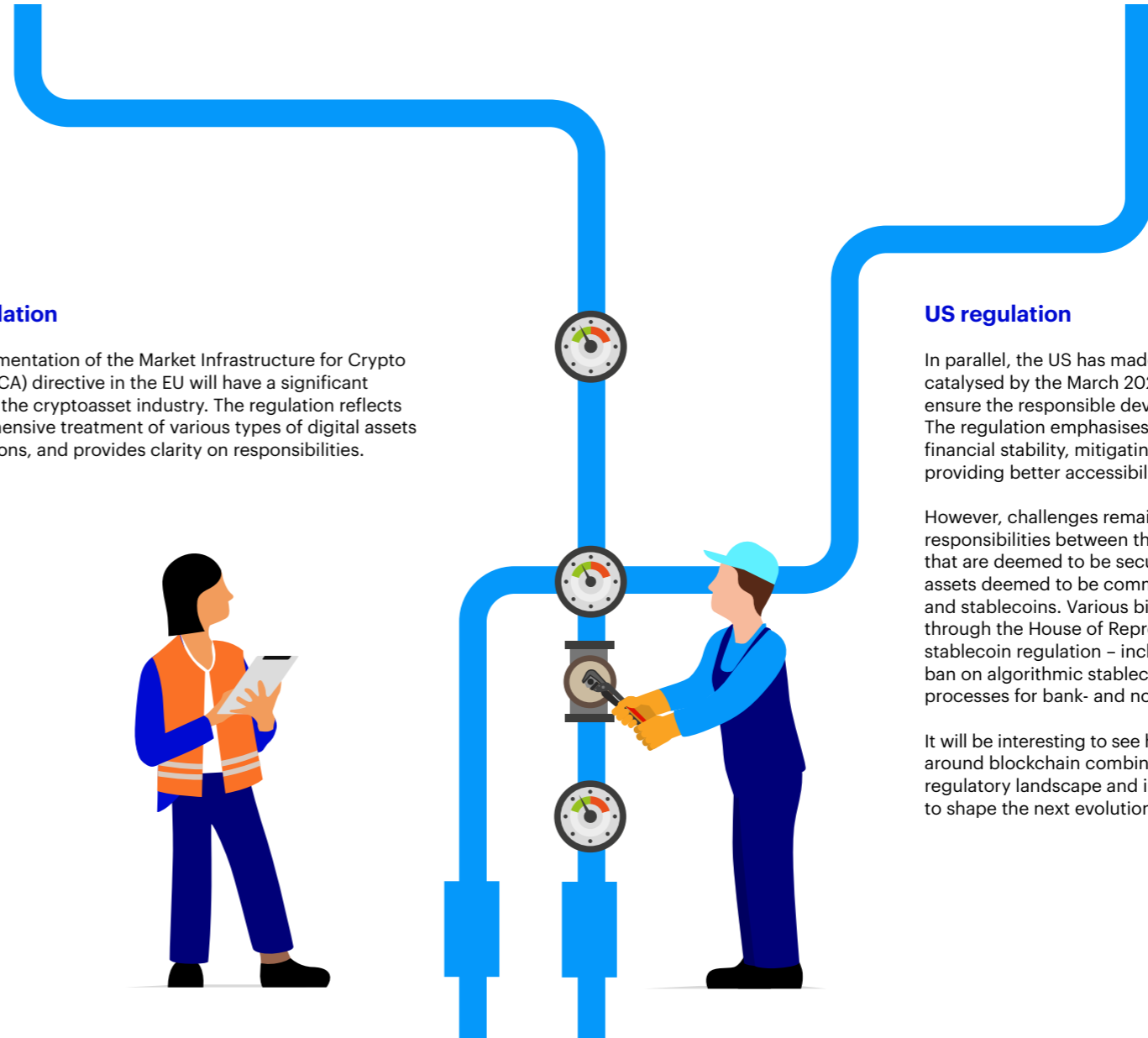
The implementation of the Market Infrastructure for Crypto Assets (MiCA) directive in the EU will have a significant impact on the cryptoasset industry. The regulation reflects a comprehensive treatment of various types of digital assets and functions, and provides clarity on responsibilities.

## US regulation

In parallel, the US has made progress on regulation, catalysed by the March 2020 Executive Order to ensure the responsible development of cryptoassets. The regulation emphasises protecting consumers, financial stability, mitigating illicit finance and providing better accessibility to financial services.

However, challenges remain in delegating responsibilities between the SEC (those cryptoassets that are deemed to be securities), the CFTC (those assets deemed to be commodities or derivatives) and stablecoins. Various bills continue to proceed through the House of Representatives, particularly stablecoin regulation – including a proposed one-year ban on algorithmic stablecoins – and new approval processes for bank- and non-bank-issued stablecoins.

It will be interesting to see how the key considerations around blockchain combine with the evolving regulatory landscape and investor sentiment to shape the next evolution of digital asset markets.



# The case for regulation

Regulation struggles to keep up with the pace of blockchain innovation, but recent failures clearly illustrate the need for increased and effective regulation to carry over some proven safeguards from traditional finance, but without stifling digital assets' innovation.

## Winter clouds, silver linings: the appetite for regulation

FTX's failure illustrates the risks that consumers face, as well as the stability of the broader crypto industry from the lack of transparency on proof of reserves, effective management of liquidity risks, separation of functions, and supervision across all these areas.

Parts of the blockchain industry have pushed back against regulation previously, but many more now recognise the need. According to Changpeng Zhao, CEO of Binance: "We do need some regulations, we do need to do this properly, we do need to do this in a stable way." Even so, challenges for regulating cryptocurrencies are significant.

## EU regulation

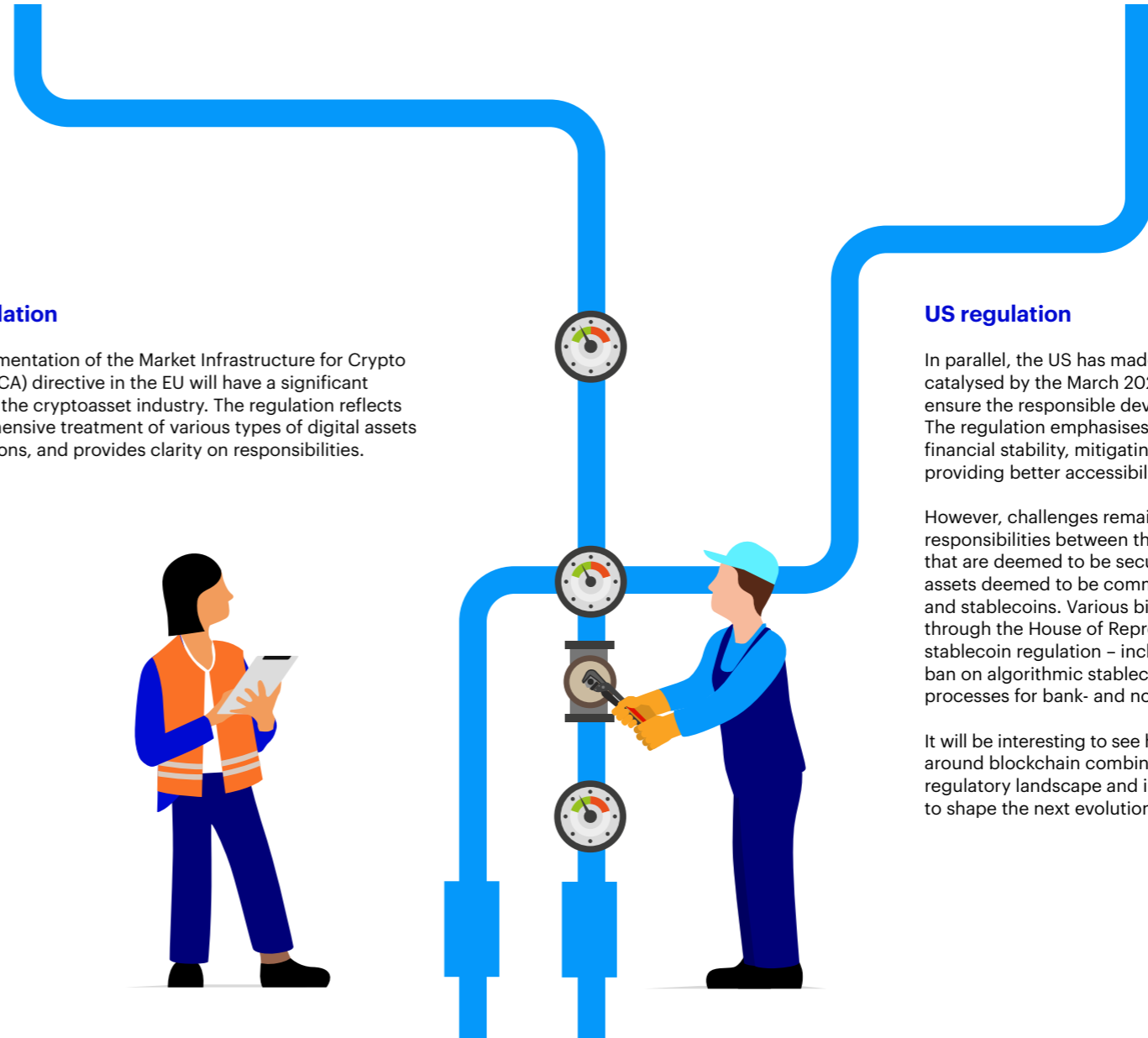
The implementation of the Market Infrastructure for Crypto Assets (MiCA) directive in the EU will have a significant impact on the cryptoasset industry. The regulation reflects a comprehensive treatment of various types of digital assets and functions, and provides clarity on responsibilities.

## US regulation

In parallel, the US has made progress on regulation, catalysed by the March 2020 Executive Order to ensure the responsible development of cryptoassets. The regulation emphasises protecting consumers, financial stability, mitigating illicit finance and providing better accessibility to financial services.

However, challenges remain in delegating responsibilities between the SEC (those cryptoassets that are deemed to be securities), the CFTC (those assets deemed to be commodities or derivatives) and stablecoins. Various bills continue to proceed through the House of Representatives, particularly stablecoin regulation – including a proposed one-year ban on algorithmic stablecoins – and new approval processes for bank- and non-bank-issued stablecoins.

It will be interesting to see how the key considerations around blockchain combine with the evolving regulatory landscape and investor sentiment to shape the next evolution of digital asset markets.



Section 1

## Overview

> Explore more



Section 2

## Winter has come

> Explore more

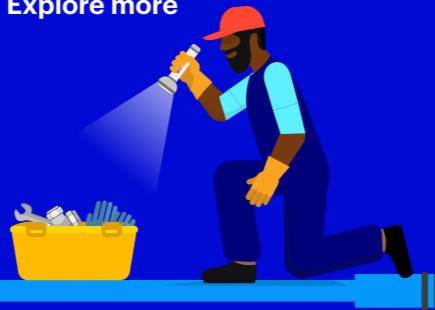


Section 3

## Building during winter

- > Tokenisation
- > Web3 and NFTs
- > Metaverse

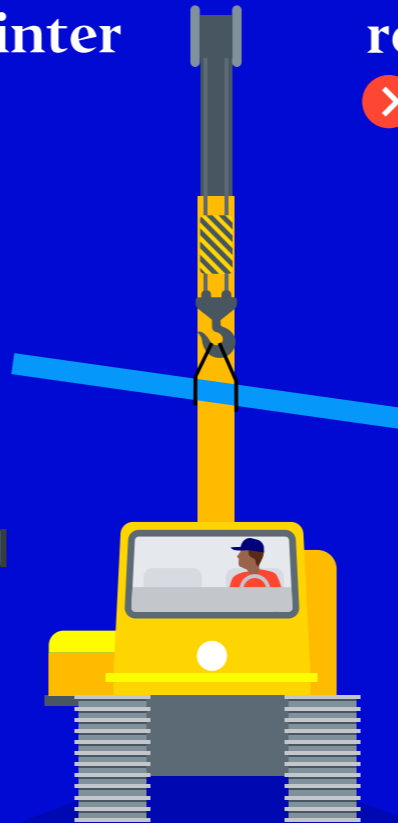
> Explore more



Section 4

## The case for regulation

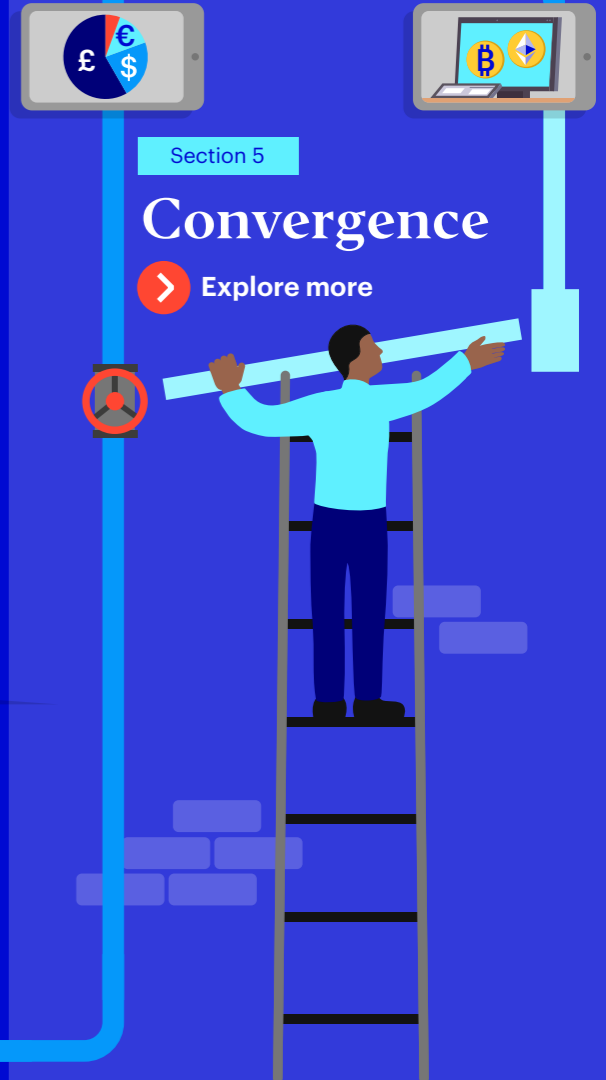
> Explore more



Section 5

## Convergence

> Explore more



# Bonus section

Dive deeper into blockchain by exploring why Traditional Finance has started interacting with Decentralised Finance, including the potential benefits.



# Convergence

The cryptoasset world has faced major tremors through fraud, theft and failure of centralised entities. But many innovations remain promising for traditional finance (TradFi), potentially leading to an era of convergence between crypto, DeFi and TradFi.

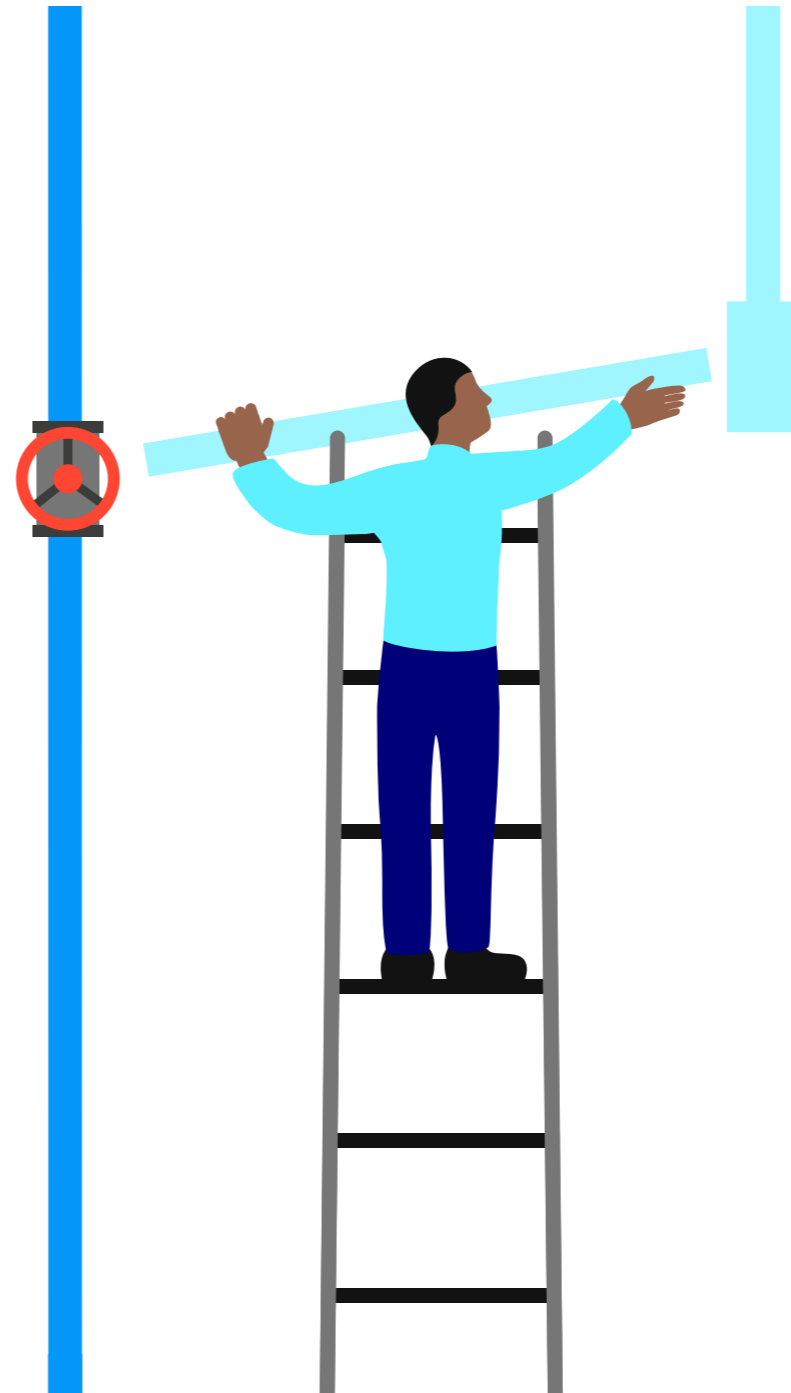
## Lending benefits of DeFi

In 2022, the IMF analysed the cost of credit among Advanced and Developing economy banks and non-banks versus DeFi (Aave and Compound to be exact), demonstrating the much lower credit costs that DeFi can deliver.

## Transforming traditional financial services

Many established institutions are exploring how DeFi could help transform traditional financial services, such as:

- SocGen's Forge subsidiary participated in a \$30 million loan of the Dai stablecoin from the Maker Dao credit DeFi protocol, using tokenised bonds as collateral.
- Huntingdon Valley Bank proposed to work with Maker Dao, using mortgages as real world asset collateral to fund further lending.
- Project Mariana, a collaboration between BIS, Bank of France, MAS and the Swiss National Bank, is exploring the use of Automated Market Makers (a typical feature of decentralised exchanges) to increase settlement efficiency in the FX market.
- Project Guardian, launched by MAS in Singapore, brought JP Morgan's Onyx division, DBS and SBI together to show how "Institutional DeFi" could work, using a public blockchain (Polygon) and tokenised securities and cash. Participating banks acted as "Trust Anchors" through the use of W3C verifiable credentials, with transactions taking place on a version of the Aave DeFi protocol.



## Ever closer

The parallel worlds of Crypto/DeFi and TradFi are inching closer together, with TradFi potentially leveraging the benefits of real world assets as collateral on DeFi protocols, addressing regulatory concerns through the trust anchor model. Meanwhile, the unregulated side of Crypto/DeFi will continue to evolve in parallel but most likely with an increasing regulatory focus after FTX's failure.

What future monetary systems we finally end up with will depend on the innovations yet to come, the collaboration between TradFi institutions and between TradFi and DeFi, and of course the regulators' balancing act of addressing consumer protection and financial stability while facilitating responsible innovation.

# Convergence

The cryptoasset world has faced major tremors through fraud, theft and failure of centralised entities. But many innovations remain promising for traditional finance (TradFi), potentially leading to an era of convergence between crypto, DeFi and TradFi.

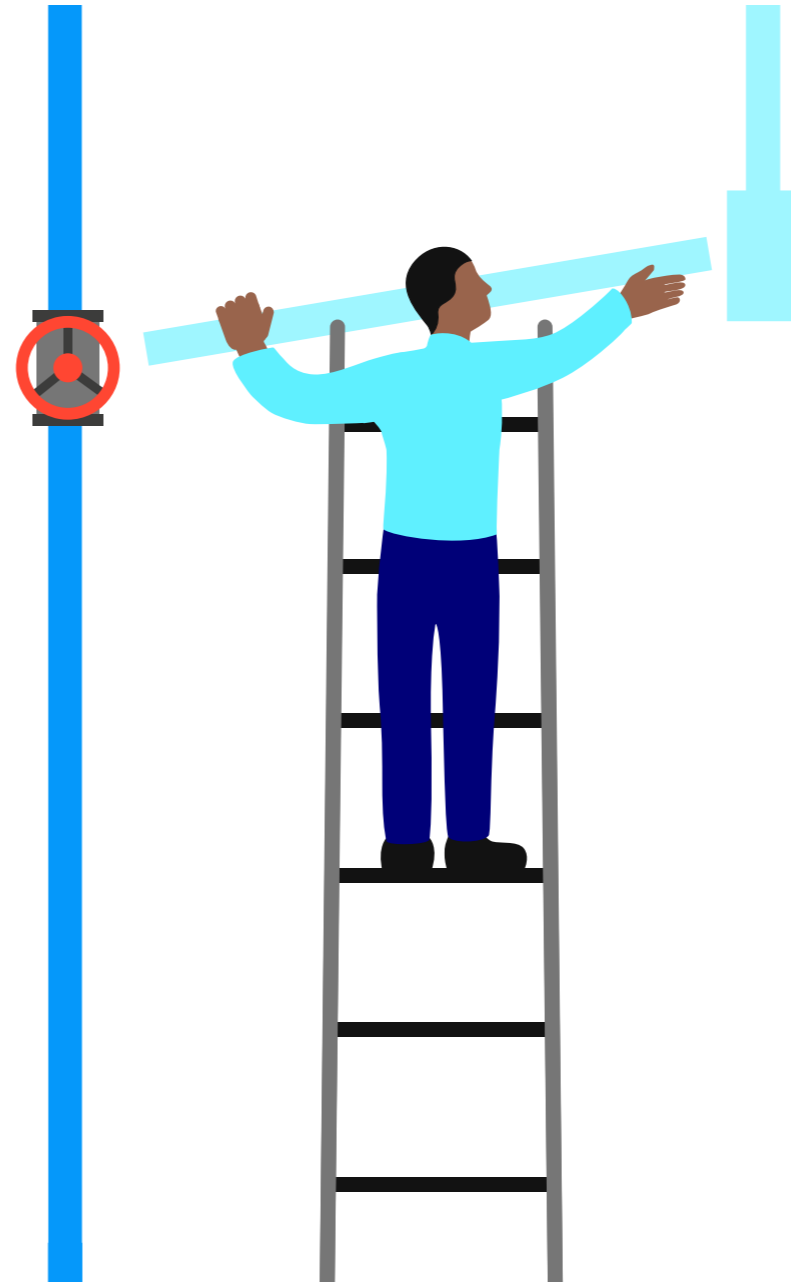
## Lending benefits of DeFi

In 2022, the IMF analysed the cost of credit among Advanced and Developing economy banks and non-banks versus DeFi (Aave and Compound to be exact), demonstrating the much lower credit costs that DeFi can deliver.

## Transforming traditional financial services

Many established institutions are exploring how DeFi could help transform traditional financial services, such as:

- SocGen's Forge subsidiary participated in a \$30 million loan of the Dai stablecoin from the Maker Dao credit DeFi protocol, using tokenised bonds as collateral.
- Huntingdon Valley Bank proposed to work with Maker Dao, using mortgages as real world asset collateral to fund further lending.
- Project Mariana, a collaboration between BIS, Bank of France, MAS and the Swiss National Bank, is exploring the use of Automated Market Makers (a typical feature of decentralised exchanges) to increase settlement efficiency in the FX market.
- Project Guardian, launched by MAS in Singapore, brought JP Morgan's Onyx division, DBS and SBI together to show how "Institutional DeFi" could work, using a public blockchain (Polygon) and tokenised securities and cash. Participating banks acted as "Trust Anchors" through the use of W3C verifiable credentials, with transactions taking place on a version of the Aave DeFi protocol.



## Ever closer

The parallel worlds of Crypto/DeFi and TradFi are inching closer together, with TradFi potentially leveraging the benefits of real world assets as collateral on DeFi protocols, addressing regulatory concerns through the trust anchor model. Meanwhile, the unregulated side of Crypto/DeFi will continue to evolve in parallel but most likely with an increasing regulatory focus after FTX's failure.

What future monetary systems we finally end up with will depend on the innovations yet to come, the collaboration between TradFi institutions and between TradFi and DeFi, and of course the regulators' balancing act of addressing consumer protection and financial stability while facilitating responsible innovation.

# Convergence

The cryptoasset world has faced major tremors through fraud, theft and failure of centralised entities. But many innovations remain promising for traditional finance (TradFi), potentially leading to an era of convergence between crypto, DeFi and TradFi.

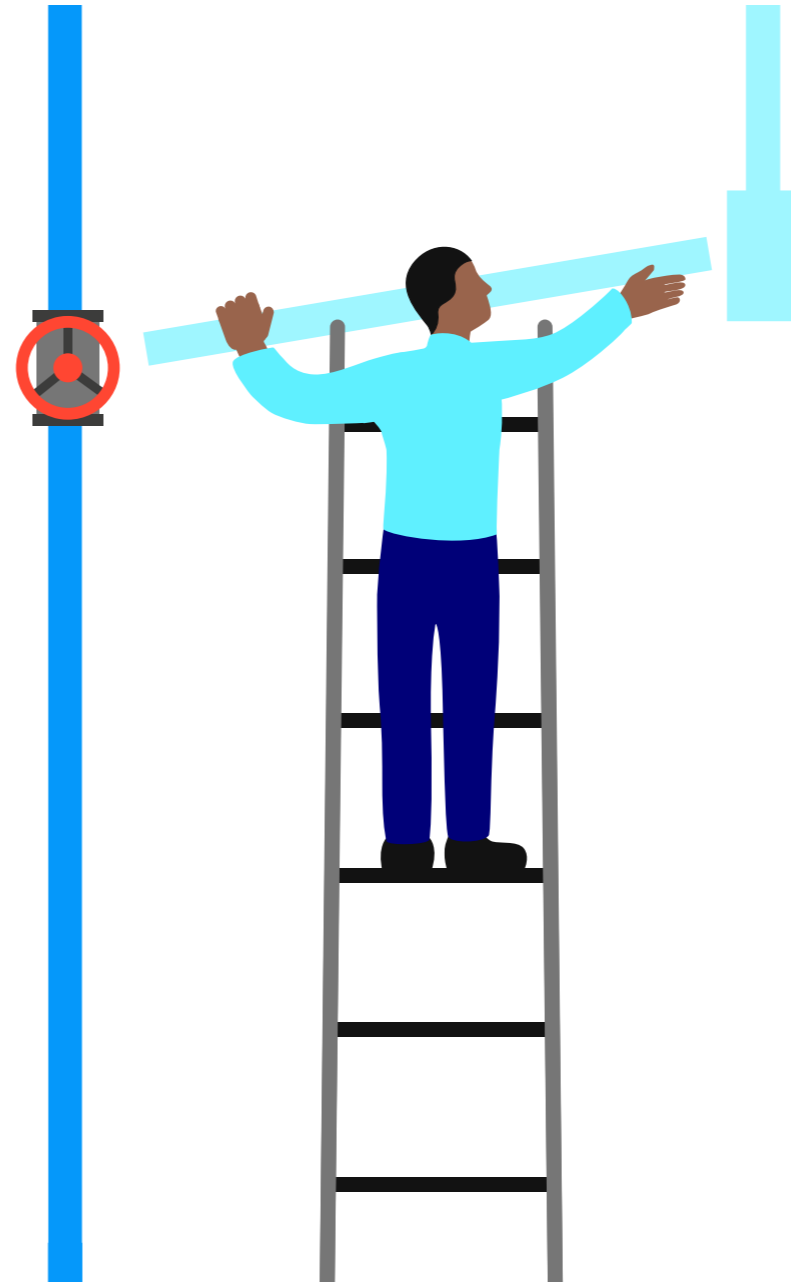
## Lending benefits of DeFi

In 2022, the IMF analysed the cost of credit among Advanced and Developing economy banks and non-banks versus DeFi (Aave and Compound to be exact), demonstrating the much lower credit costs that DeFi can deliver.

## Transforming traditional financial services

Many established institutions are exploring how DeFi could help transform traditional financial services, such as:

- SocGen's Forge subsidiary participated in a \$30 million loan of the Dai stablecoin from the Maker Dao credit DeFi protocol, using tokenised bonds as collateral.
- Huntingdon Valley Bank proposed to work with Maker Dao, using mortgages as real world asset collateral to fund further lending.
- Project Mariana, a collaboration between BIS, Bank of France, MAS and the Swiss National Bank, is exploring the use of Automated Market Makers (a typical feature of decentralised exchanges) to increase settlement efficiency in the FX market.
- Project Guardian, launched by MAS in Singapore, brought JP Morgan's Onyx division, DBS and SBI together to show how "Institutional DeFi" could work, using a public blockchain (Polygon) and tokenised securities and cash. Participating banks acted as "Trust Anchors" through the use of W3C verifiable credentials, with transactions taking place on a version of the Aave DeFi protocol.



## Ever closer

The parallel worlds of Crypto/DeFi and TradFi are inching closer together, with TradFi potentially leveraging the benefits of real world assets as collateral on DeFi protocols, addressing regulatory concerns through the trust anchor model. Meanwhile, the unregulated side of Crypto/DeFi will continue to evolve in parallel but most likely with an increasing regulatory focus after FTX's failure.

What future monetary systems we finally end up with will depend on the innovations yet to come, the collaboration between TradFi institutions and between TradFi and DeFi, and of course the regulators' balancing act of addressing consumer protection and financial stability while facilitating responsible innovation.

# Convergence

The cryptoasset world has faced major tremors through fraud, theft and failure of centralised entities. But many innovations remain promising for traditional finance (TradFi), potentially leading to an era of convergence between crypto, DeFi and TradFi.

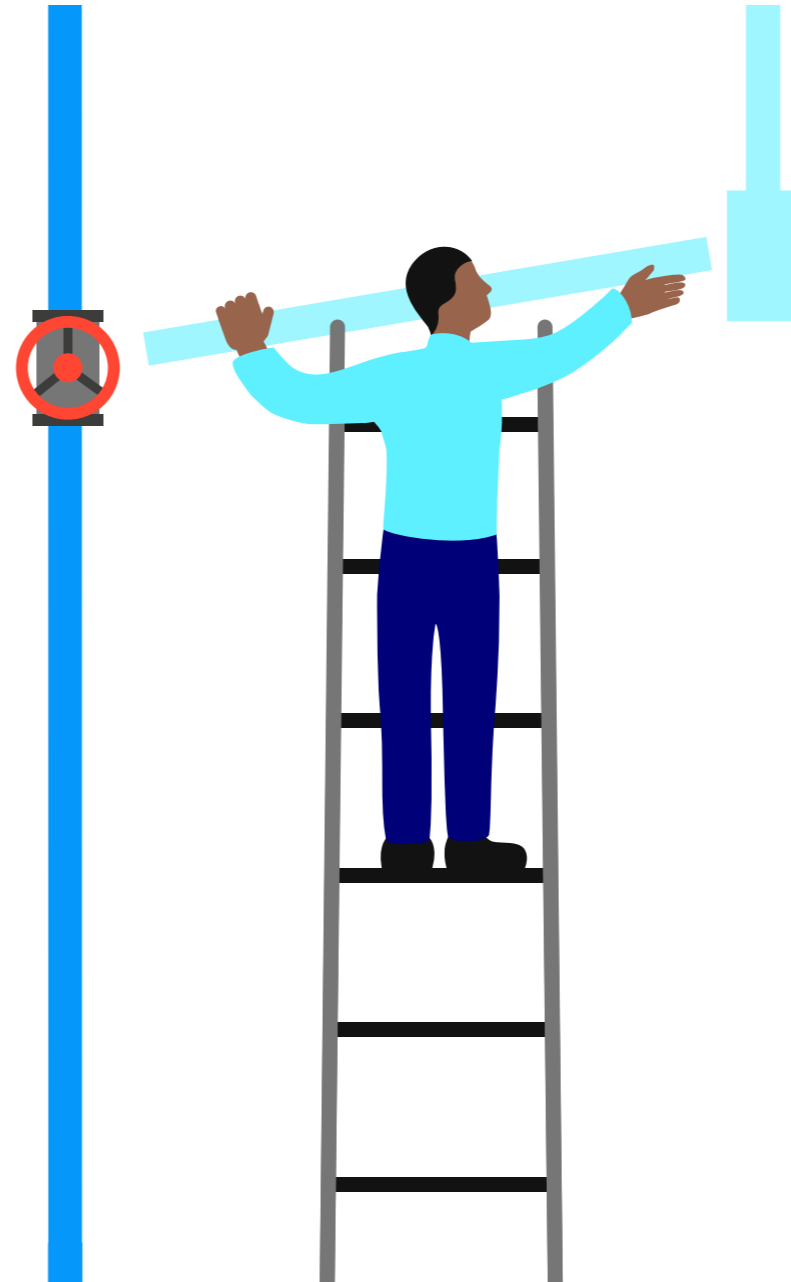
## Lending benefits of DeFi

In 2022, the IMF analysed the cost of credit among Advanced and Developing economy banks and non-banks versus DeFi (Aave and Compound to be exact), demonstrating the much lower credit costs that DeFi can deliver.

## Transforming traditional financial services

Many established institutions are exploring how DeFi could help transform traditional financial services, such as:

- SocGen's Forge subsidiary participated in a \$30 million loan of the Dai stablecoin from the Maker Dao credit DeFi protocol, using tokenised bonds as collateral.
- Huntingdon Valley Bank proposed to work with Maker Dao, using mortgages as real world asset collateral to fund further lending.
- Project Mariana, a collaboration between BIS, Bank of France, MAS and the Swiss National Bank, is exploring the use of Automated Market Makers (a typical feature of decentralised exchanges) to increase settlement efficiency in the FX market.
- Project Guardian, launched by MAS in Singapore, brought JP Morgan's Onyx division, DBS and SBI together to show how "Institutional DeFi" could work, using a public blockchain (Polygon) and tokenised securities and cash. Participating banks acted as "Trust Anchors" through the use of W3C verifiable credentials, with transactions taking place on a version of the Aave DeFi protocol.



## Ever closer

The parallel worlds of Crypto/DeFi and TradFi are inching closer together, with TradFi potentially leveraging the benefits of real world assets as collateral on DeFi protocols, addressing regulatory concerns through the trust anchor model. Meanwhile, the unregulated side of Crypto/DeFi will continue to evolve in parallel but most likely with an increasing regulatory focus after FTX's failure.

What future monetary systems we finally end up with will depend on the innovations yet to come, the collaboration between TradFi institutions and between TradFi and DeFi, and of course the regulators' balancing act of addressing consumer protection and financial stability while facilitating responsible innovation.

# For more information

Telephone +44 20 3370 1100

Email [invest@invesco.com](mailto:invest@invesco.com)

Portman Square House,  
43–45 Portman Square,  
London W1H 6LY

[etf.invesco.com](http://etf.invesco.com)

## About the authors



### Keith Bear

Fellow, Cambridge Centre  
for Alternative Finance (CCAF)

Keith Bear was appointed a Fellow at the Cambridge Centre for Alternative Finance (CCAF) in 2019, having previously led the Financial Markets industry at IBM where he worked on multiple blockchain projects. Keith's focus at CCAF is on Digital Assets and Regulatory Innovation. Keith sits on advisory boards for 4 fintechs and is a member of ESMA's Consultative Working Group for Financial Innovation as well as the Bank of England's CBDC Technology Forum.



### Alexander Olivares

Head of EMEA Campaign  
Marketing, Invesco

Alexander Olivares is Head of EMEA Campaign Marketing at Invesco. Prior to that he worked in various marketing and writing roles within asset management. Alexander holds a Global Executive MBA from TRIUM (London School of Economics – New York University – HEC Paris) and a BA in English Literature from the University of Chicago.

## Risk warnings

The value of investments and any income will fluctuate (this may partly be the result of exchange rate fluctuations) and investors may not get back the full amount invested.

## Important information

This marketing communication is exclusively for use by Professional Clients and Financial Advisers in Continental Europe as defined below, Qualified Clients/Sophisticated Investors in Israel and Professional Clients in Dubai, Ireland, Isle of Man, Jersey, Guernsey and the UK. It is not intended for and should not be distributed to, or relied upon, by the public. By accepting this material, you consent to communicate with us in English, unless you inform us otherwise.

This is marketing material and not intended as a recommendation to buy or sell any particular asset class, security or strategy. Regulatory requirements that require impartiality of investment/investment strategy recommendations are therefore not applicable nor are any prohibitions to trade before publication.

Where individuals or the business have expressed opinions, they are based on current market conditions, they may differ from those of other investment professionals, they are subject to change without notice and are not to be construed as investment advice.

**For the distribution of this communication, Continental Europe is defined as Austria, Belgium, Bulgaria, Croatia, Czech Republic, Finland, France, Germany, Hungary, Italy, Kosovo, Liechtenstein, Luxembourg, The Netherlands, North Macedonia, Norway, Romania, Spain, Sweden and Switzerland.**

**Issued by Invesco Management S.A., President Building, 37A Avenue JF Kennedy, L-1855 Luxembourg, regulated by the Commission de Surveillance du Secteur Financier, Luxembourg; Invesco Asset Management, (Schweiz) AG, Talacker 34, 8001 Zurich, Switzerland; Invesco Asset Management Limited, Perpetual Park, Perpetual Park Drive, Henley-on-Thames, Oxfordshire RG9 1HH, UK. Authorised and regulated by the Financial Conduct Authority; Invesco Asset Management Deutschland GmbH, An der Welle 5, 60322 Frankfurt am Main, Germany.**

**Israel:** This communication may not be reproduced or used for any other purpose, nor be furnished to any other person other than those to whom copies have been sent. Nothing in this communication should be considered investment advice or investment marketing as defined in the Regulation of Investment Advice, Investment Marketing and Portfolio Management Law, 1995 ("the Investment Advice Law"). Investors are encouraged to seek competent investment advice from a locally licensed investment advisor prior to making any investment. Neither Invesco Ltd. nor its subsidiaries are licensed under the Investment Advice Law, nor does it carry the insurance as required of a licensee thereunder.

© 2023 Invesco. All rights reserved.

EMEA2647702/2023