

# Blockchain and ESG

Using blockchain for sustainability and green finance

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# Blockchain: a solution or an oxymoron to sustainability?

Many headlines would have you believe that blockchain and sustainability are something of an oxymoron. It is undeniable that certain consensus protocols (that is, the way in which blocks are created) may consume a significant amount of energy and can therefore have a large environmental footprint if improperly executed. However, the applications of blockchain technology go far beyond its use as the technology underpinning virtual assets. Its transparent, immutable and decentralised design lends itself to countless benefits, including its contribution to building a greener, more sustainable future in finance.

In this article, we explore how blockchain in finance can contribute towards achieving the United Nations' ("UN") sustainable development goals ("SDGs"). The UN's SDGs are commonly referred to as the framework for achieving environmental, social and governance ("ESG") goals and outcomes.

## The sustainable development goals

The 2030 Agenda for Sustainable Development was adopted by all UN Member States in 2015, building on the principle of "leaving no one behind" emphasising sustainable development for all. At its heart are 17 SDGs which are an urgent call for action by all countries in global partnership to end poverty, improve health and education, reduce inequality, and spur economic growth – all while tackling climate change and working to preserve our oceans and forests.

## How does blockchain come in?

Blockchain's potential ESG applications are numerous. With a focus on financial application, we discuss in particular how blockchain lends itself to the following SDGs (depicted in icon form).



**Environmental.** The use of blockchain to change traditional financial transaction flows and create economic return while supporting climate action. For example, through improved carbon emissions trading, facilitated clean energy trading, green bonds issuance, and better tracking and reporting of greenhouse gas emissions reduction.



**Governance.** The use of blockchain to maximise transparency and trust between countries and organisations to maximise trades and ensure standardisation.



**Social.** The use of blockchain to enable financial inclusion in underdeveloped countries facing poverty, underdeveloped economies and inequality. Blockchain can also be pivotal in the healthcare industry, assisting with data tracking, patient management and surveillance of clinical trials.

# Blockchain and environmental considerations

A significant portion of the SDGs are linked to the “E” of ESG – responsible consumption and production, climate action, life on land and in the sea, and affordable and clean energy. There is a big push by countries to become greener and to meet their Paris Agreement commitments. China has pledged to achieve peak carbon emissions by 2030 and to be carbon neutral by 2060. Achieving these goals will take a huge amount of finance (see our previous alert, [Achieving Net Zero](#)). Blockchain technology can support required changes, with huge potential to play a significant role in the blossoming voluntary carbon market sector and through its decentralised nature which fosters transparency, standardisation and trust.

## How can blockchain tackle carbon emissions?

Throughout our series of ESG client alerts we have promoted the simple message that organisations must:



**Measure**  
carbon emissions



**Reduce**  
carbon emissions



**Offset**  
carbon emissions

Blockchain can play a significant role in this process and is already being relied upon significantly in the voluntary carbon market space.

- **Measuring** – we cannot reduce and offset what we cannot measure. The first step is therefore to measure carbon footprint. For this to be successful, *how* emissions are measured, including the metrics and formulas used, must be aligned across countries and organisations. By way of example, measuring 10 kilometres and 10 yards would spit out completely different distances; likewise, measuring 10 litres in one month and one year, would raise entirely different amounts. The same applies to measuring carbon emissions (albeit with far more complex measurements). With carbon emissions, there are specific rules to compute and translate activities into sustainability information, such as carbon calculation models and carbon factors. These vary by country and are constantly evolving.

To reduce the carbon footprint globally, countries, organisations and industries must be able to collect and track reliable and trusted data accurately and repeatedly, to get meaningful measurements. By reporting carbon emissions across a blockchain network, countries and organisations would create a single, standardised platform for carbon measurement, providing a network that can report emissions in a consistent, immutable and tamper-proof manner. This facilitates connections between all participants around a trusted platform that uses standardised algorithms to guarantee transparency and traceability. It also holds countries, organisations and industries accountable for their emissions. Moreover, with its transparency, blockchain could also serve as a tool to monitor the progress made in implementing the Nationally Determined Contributions under the Paris Agreement.

### Case study 1: Energy Blockchain Labs Inc

*Beijing company Energy Blockchain Lab and technology conglomerate IBM have created a blockchain platform to trade carbon assets in the Mainland, which allows high-emission organisations to monitor their carbon footprints and meet quotas by buying carbon credits from low emitters.\**

\* <https://www.ibm.com/case-studies/energy-blockchain-labs-inc>





- **Offsetting** – carbon offsetting is a mechanism whereby organisations can compensate for their unavoidable carbon emissions through the support of certified emission reduction projects that absorb or reduce emissions. This action is realised through the purchase of carbon credits that reduce emissions from other sources. A key issue with offsetting relates to double counting carbon credits which seriously undermines the process.

Blockchain can prevent double counting with the use of smart contracts. With smart contracts in place, carbon credits that are already issued and logged onto the blockchain, cannot be (re)allocated to another organisation. The smart contract on the blockchain would not allow that and unlike normal contracts, there is no risk of human error or manipulation of the contract. However, as with all blockchain solutions, implementation of smart contracts must be carefully considered to be successful. All blockchain solutions, including in relation to technical infrastructure, must be developed having close regard to a problem statement, and must be appropriate to address that problem and its targeted deployment reach.

An example of a technical consideration is in relation to the use of either a un-permissioned or permissioned blockchain. With un-permissioned blockchains, such as Ethereum, public addresses are completely open allowing anyone to view transactions logged on the blockchain. With permissioned blockchains, this transparency can be controlled, with only authorised entities holding a copy of the ledger or being able to participate in transactions. Both promote transparency but the more controlled level of transparency offered by a permissioned blockchain offers an enhanced level of control and security.

The self-executing and self-enforcing nature of smart contracts also reduces the need for third party auditors, registries and transactions. This is because the algorithm behind the smart contract verifies whether the transaction data is up to the standard that was agreed when the smart contract was created, before adding a block representing the transaction onto the chain. This ensures the integrity of data prior to generation of a new block on the blockchain in a way that is not possible with manual, human involvement.

**Case study:** Global banks CIBC, Itaú, NAB and NatWest Group have launched a carbon offset platform to drive transparency in the voluntary carbon market. The pilot launched in August 2021 and is said to align with the leading Taskforce on Scaling Voluntary Carbon Markets, established by Mark Carney, UN Special Envoy for Climate Action. It is built on a private Ethereum platform developed by ConsenSys.\*

(How voluntary markets work and the role of the Taskforce on Scaling Voluntary Carbon Markets is detailed in our earlier release, [Carbon Trading - Practical insights](#))

\* <https://www.prnewswire.com/news-releases/cibc-itaunab-and-natwest-group-launch-carbon-offset-platform-to-drive-transparency-in-voluntary-carbon-market-301326442.html>

# How can blockchain and green finance work together?

International interest in green finance has grown significantly in recent years. More than US\$1 trillion cumulatively in green bonds have been issued to date, with the global green bond market issuing a record US\$269.5 billion in 2020, an increase from US\$266.5 billion in 2019.\*

Those wanting to transition to cleaner processes and systems and to develop green projects will need green finance. Examples of green finance include green bonds, green-tagged loans, green investment funds, and climate risk insurance. Whatever the product, the main goal is to increase the importance of financial markets in solving environmental problems to ensure a sustainable future.

Tokenising (ie converting assets into digital units on the blockchain) green securities could be groundbreakingly useful for a myriad of reasons. For example, blockchain technology and digital securities can drive significant efficiencies, depending on the degree of innovation adopted.

**Case study 2:** *The Bank for International Settlements Innovation Hub Hong Kong Centre and Hong Kong Monetary Authority are collaborating on Project Genesis, a green finance project for the tokenisation of green bonds using blockchain technology. The project will leverage blockchain, smart contracts, internet of things and digital assets for green bond distribution and improving transparency on the use of proceeds.\*\**

Even in markets where the demand for green bonds is high because investors are motivated by ESG considerations, tokenisation helps investors diversify their portfolio across different bonds because of smaller subscription sizes. On the flipside, in markets where demand for green bonds is limited, tokenisation has the potential to expand the pool of capital available to green bond issuances by bringing to the table smaller investors – for example, those who want to contribute to a green future, but with limited funds or a lower grade investment appetite.

Tokenising green bonds can also significantly drive down the cost of green finance. The estimated cost of issuing a green bond under a standard process is just under US\$6.5 million but this could be reduced by almost 90% for a full blockchain automated issuance.\*\*\* This makes green bond issuance a far more attractive option, welcoming younger generations to take charge of their own future.

Blockchain can also support a range of other important functions for green finance. For example, blockchain enabled reporting tools allow companies to generate ESG reports that demonstrate their ESG credentials. Blockchain-enabled smart readers can be used to track renewable energy from the point of generation to the point of trade, bringing new end-to-end levels of visibility. Blockchain can also replace paper heavy bills of lading in trade finance through the use of smart contracts on the blockchain, allowing for faster and more efficient transactions, through:

- real-time review of a purchase agreement and draft terms of credit by the import bank;
- digital signatures following goods inspections;
- review and approval of payment obligations through a smart contract by the export bank; and
- digital acknowledgment of receipt of goods to trigger payment by the importer.

It can also assist with secure sharing of KYC information by storing customer information on decentralised blocks

See our previous alert, [ESG and Sustainable Investment in Hong Kong](#), for more on green finance.

\* <https://www.climatebonds.net/2021/01/record-2695bn-green-issuance-2020-late-surge-sees-pandemic-year-pip-2019-total-3bn>

\*\* <https://www.bis.org/press/p210824.htm>

\*\*\* <https://greendigitalfinancealliance.org/wp-content/uploads/2019/12/blockchain-gateway-for-sustainability.pdf> (page 17)



## But, virtual assets can be bad for the environment!

It is only right that we consider the other side of the virtual coin. While blockchain can offer many ESG advantages, mining virtual assets requires high levels of energy consumption resulting in increased carbon emissions. The Mainland recently banned crypto mining operations in inner Mongolia due to concerns about its climate commitments.

Although this is true for mined virtual assets, it is worth noting that a large number of virtual assets do not have such detrimental effects on the environment. For example, some proof-of-stake (“**PoS**”) blockchains process transactions using the same energy requirements as an ordinary computer network. While there are advantages of a PoS blockchain, it is not always possible or is otherwise difficult for established networks to transition into. Likewise, strong “mining believers” may argue that PoS mechanisms have limitations. Instead, they may seek to reduce energy consumption by seeking out cold environments to reduce the cooling requirements needs for the machines. Many also regularly use sustainable energy to drive down costs, with a number of new companies committing to use 100% green energy. A number of bitcoin mining companies have also committed to offset their carbon footprint through not only the purchase of carbon credits but also investment in the production of clean energy.

### Bolstering direct regulatory standards

To date, ESG standards have largely had an *indirect* impact on blockchain – providing some opportunities for blockchain and smart contracts to support ESG initiatives as a technological tool (eg tokenised carbon credits) or by shaping choices by reference to the environmental impact of a particular application of blockchain (eg certain virtual assets).

Interestingly, certain regulators are starting to tackle the issue of virtual assets and climate change as part of new virtual asset service provider (or “VASP”) regimes. For example, the Markets in Crypto-assets (“**MiCA**”) is a regulatory framework developed to help streamline distributed ledger technology and virtual asset regulation in the European Union (“**EU**”). The newly introduced Article 3a of the MiCA relates directly to environmental sustainability of virtual assets, stating specifically that virtual assets issued, offered or admitted to trading in the EU must meet a specified environmental sustainability criteria. Where a virtual asset relies on an environmentally unsustainable consensus mechanism, it may only operate at a small scale.

*Note: Under the MiCA, a consensus mechanism shall be deemed environmentally unsustainable if it might have a significant environmental impact when operated at sufficiently large scale, considering the consumption of energy, the use of real resources, carbon emissions, electronic waste and specificities of the incentive design. An environmentally unsustainable consensus mechanism shall be deemed to be operated at small scale if, due to the limited scale of its operations, its environmental impact can be safely assumed not to cause significant harm to any of the environmental objectives set out in Regulation (EU) 2020/852 [Taxonomy Regulation] as well as not to jeopardise the achievement of the EU objectives of the Paris Agreement.*

**Case study:** Singapore’s **DBS Bank**, the **Singapore Exchange**, **Standard Chartered** and **Temasek** plan a global carbon exchange using blockchain. They have set up Climate Impact X to trade carbon credits. The project aims to focus on natural climate solutions with aims to conserve or restore natural ecosystems using technology such as satellite monitoring (ie to ensure forests and mangroves are expanding), machine learning and blockchain for transparency.\*\*\*

\* <https://www.newyorker.com/news/daily-comment/why-bitcoin-is-bad-for-the-environment#>

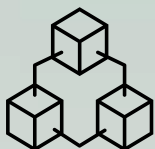
\*\* <https://www.bbc.com/news/technology-56012952>

\*\*\* [https://www.sgx.com/media-centre/20210520-dbs-sgx-standard-chartered-and-temasek-take-climate-action-through-global?utm\\_medium=display&utm\\_source=sgx-web&utm\\_campaign=alwayson&utm\\_term=20052021&utm\\_content=NR](https://www.sgx.com/media-centre/20210520-dbs-sgx-standard-chartered-and-temasek-take-climate-action-through-global?utm_medium=display&utm_source=sgx-web&utm_campaign=alwayson&utm_term=20052021&utm_content=NR)

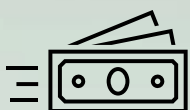
# Blockchain and socio-economic considerations

SDGs relating to achieving zero poverty, zero hunger, eradicating inequality and ensuring decent work and economic growth for all, are particularly relevant in the “S” of ESG. Central to achieving change this is financial inclusion.

Financial exclusion is estimated to effect around 1.7 billion people worldwide\* who lack access to even the most basic of financial services. There are many reasons for financial exclusion including geographic barriers, lack of identity documents and lack of trust in local financial institutions. This is where blockchain can offer solutions.



Blockchain can support the creation of a trusted framework for transactions between parties who do not know each other. Rules are dictated by the consensus protocol and related smart contracts. Of course, the technology needs to be robust – both in relation to fundamental design and in relation to applications.



Blockchain can facilitate remittances for migrants seeking to transfer small amounts of money overseas because of significantly lower transfer fees, given the near real time and accurate transaction system that does not involve traditional clearing houses, debit card and bank costs and fees.



Blockchain can support digital identity initiatives. There are blockchain solutions that can record user profiles based on biometrics that can assist in verifying an individual's identity without the need to supply documentation or over-disclose unnecessary information. This is arguably more secure and robust against identity theft. Using zero-knowledge proof, a blockchain transaction can be verified while maintaining user anonymity. It is a technique which allows a “prover” with private data to provide verifiable proof that certain property holds true for that data without revealing the data itself.

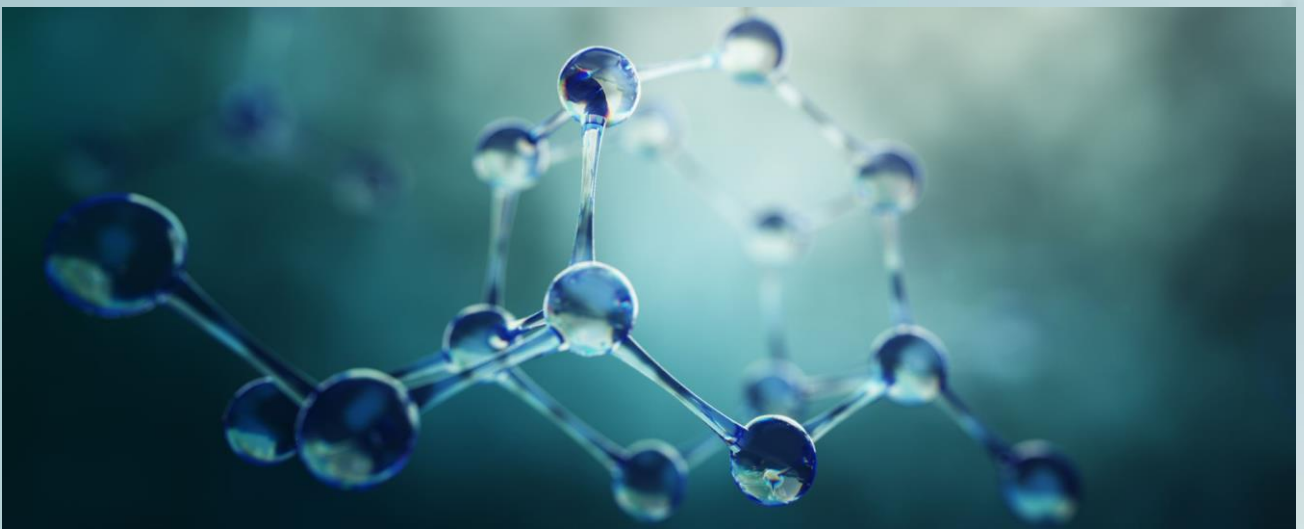
## Case study: World Food Programme Building Blocks\*\*

*Among the digital finance pioneers for humanitarian settings, the World Food Programme uses blockchain technology as part of its “Building Blocks” flagship initiative, to expand refugees’ choices in how they access and spend their cash. Building Blocks enables cash value to reach refugees in conflict zones using blockchain technology. Local financial institutions can often be unreliable or inaccessible in conflict zones and to refugees.*

*Building Blocks uses digital cash vouchers powered by the blockchain to ensure that food aid is getting to where it’s needed. Over 100,000 people living in refugee camps can purchase groceries by scanning an iris at checkout. Cash value from donors is stored in a beneficiary ‘account’ maintained on the blockchain and paid directly to the retailers through a commercial financial service provider on checkout. Built on a private, permissioned blockchain and reliant on biometric authentication technology, there is record of every transaction. For the refugees it means their aid is safe, free from corruption or theft and food is available. Financial institutions can support this without incurring significant financial transaction fees in the camp setting or security costs. At the same time, it aims to protect the beneficiary data, control financial risks and allows for greater collaboration, and aims to make cash transfers more efficient, secure and transparent.*

\* <https://globalfindex.worldbank.org/chapters/unbanked>

\*\* <https://innovation.wfp.org/project/building-blocks>



## Other “social” considerations – blockchain and healthcare

A key component in tackling the “S” of ESG is addressing healthcare, particularly given COVID-19. Blockchain has numerous benefits to offer the medical industry. For example:\*

- **Data tracking** – Governments, corporations and individuals are sharing COVID-19-related data nationally and internationally (eg in relation to outbreaks and symptoms). With a high volume of contributors and constant changes to this kind of data, the timeliness, quality, trustworthiness, auditability and accessibility of that data matters. Blockchain has the potential to assist with a number of these issues, but has a particular advantage when it comes to building a broader picture and tracking changes, trends and even anomalies over time.
- **Patient management** – Patient data management systems, including data infrastructure, patient records and analytics, are a critical component of effective patient care. They allow healthcare providers to understand a patient’s background and health history, having huge implications, including by flagging patients who are at risk of certain health conditions. The use of blockchain can grant patients easier access to, and control over, their own medical data. Blockchain-based approaches may have a unique ability to bring cohesion to an otherwise disparate and overly complicated system of delivering data across the healthcare spectrum.
- **Clinical trials and surveillance** – Blockchain presents an opportunity for clinical research. It may help in structuring more transparent, checkable methodologies and help promote clinical trial integrity given its immutable nature.

**But... data privacy and protection compliance should remain paramount.** While blockchain has a lot of offer on the healthcare front, ensuring data boundaries and compliance with data laws is a key success factor. Medical data is especially sensitive and can be subject to elevated restrictions relating to collection, use, storage and transmission. Many jurisdictions have offshore transfer restrictions, and some have data localisation requirements, each of which poses hurdles to an unrestricted cross-border flow of data. This issue is probably the most challenging in this context, but is not impossible. In particular, sophisticated permissioning, encryption and data minimisation are all hallmarks (and arguably key differentiators) of blockchain technology, which may contribute to ensuring data protection compliance.



# Blockchain and governance considerations

The “G” in ESG is often forgotten amongst concerns of climate issues and societal implications under the “E” and “S”. However, driving good governance is essential. It relates to decision-making and policy formulation which can affect the outcome and implementation of all SDGs (including environment, social and financial measures).

Amongst other factors, strong governance has certain features:

- **Fairness** – one way to achieve fairness is through the use of smart contracts; programs stored on a blockchain that run when predetermined conditions are met. Smart contracts are typically used to automate the execution of an agreement so that all participants can be immediately certain of the outcome, without any intermediary manipulation, bias or error. These virtual agreements can facilitate the exchange of money, content, shares, property, or anything of value in an automated, unbiased and arguable “fair” manner.
- **Transparency** – transparency can help government organisations and corporations work together to leverage from each other's ideas, including by having an insight into how social and environmental issues are being tackled through policy. Moreover, it can assure that commerce and trade documents, as well as other relevant data, are accessible to the public and available for criticism, for better strategy-making, trade optimisation and standardisation. Blockchain can enable the feature of transparency in transactions, policies and the immutability of asset registration.
- **Security** – poor security measures can result in data leaks and financial loss. By creating a record that cannot be altered and is encrypted end-to-end, blockchain can help prevent fraud and unauthorised activity. Privacy issues can also be addressed on blockchain by anonymising personal data, using permissions to prevent access where necessary or through zero-knowledge proof technology.

## Case studies: blockchain to tackle the “S” and “G” of ESG in supply chains

In the context of finance, organisations like [Bext360](#), [Grain Chain](#) and [Farmer Connect](#) are using blockchain to increase supply chain transparency industries trading commodities, like coffee beans and other crops. These emerging companies use a distributed, decentralised protocol on the blockchain for real-time transactions, recording data about the transactions and allowing all involved parties to access the record of payments at any time. This increases transparency as the commodities progress through the supply chain and helps to ensure farmers receive proper fair-trade payments, while ensuring security for all participants purchasing goods.

In the healthcare industry, blockchain works to make the supply and transaction flows of medical supplies or finance immune to data manipulation, and allows transparency throughout the process. For example, Alipay, along with the Zhejiang Provincial Health Commission and the province's Economy and Information Technology Department, [has launched a blockchain-based platform](#) that enables users to trace the demand and the supply chains of medical supplies.

## Case study: blockchain to reduce remittance costs and fees\*

The Philippines has a large number of overseas migrants. It is among the top five countries to receive remittances from overseas, totalling approximately US\$32.8 billion in 2018.\*\* Coins.ph is a mobile wallet and digital currency exchange. It converts overseas remittances into virtual assets prior to being sent to the recipient, who can then withdraw it as fiat currency. There are no third parties involved and there are lower fees. This process, in addition to lowering transaction costs, allows customers on both ends to continue to leverage the institutions they are used to.

\* <https://coins.ph/>

\*\* <https://www.adb.org/sites/default/files/publication/419611/migration-remittances-development-asia.pdf>

# Blockchain can drive a future in sustainable finance

Blockchain will play a strong supporting role in propelling a sustainable future for finance.

With powerful applications of blockchain constantly surfacing, and serious thought and investment going towards reducing energy consumption and tackling social inequalities through blockchain, blockchain must not be written off as a strong means to achieving the world’s sustainable goals. Well beyond the buzz around virtual assets, blockchain can contribute to a greener future with its instrumental features.

Blockchain can support transparency – including traceability and audit

Blockchain can support appropriate levels of privacy with the right legal and technical architecture

Blockchain can reduce transactional inefficiencies by leveraging the self executing nature of smart contracts

Blockchain brings an extra level of security with its immutable nature

Of course, blockchain technology is not the panacea for all solutions. Certain systems are rightfully centralised and implemented off-chain. To have powerful implications, the use of blockchain must be fit for purpose. Moreover, blockchain solutions need to comply with legal and regulatory obligations as they apply to participants and the underlying subject matter. Which particular laws apply will depend on the nature of the solution. Interestingly, blockchain itself also has the ability to enable compliance, acting as a regtech tool to deal with regulatory compliance and transparency obligations.

## Implementing ESG policies

Whether it be by regulatory requirement or the goodwill of a company, to ensure corporate success and economic growth, organisations must consider having in place ESG policies and procedures. Likewise, regulators must consider making it compulsory for large corporations and financial institutions to have in place policies with clear and specific requirements, including to have in place “ESG” specific staff who ensure sustainability goals are being met.

## We would be delighted to assist

King & Wood Mallesons has a long track record in advising on blockchain, green finance and ESG. We help clients seeking to use blockchain to achieve sustainability and financial goals, as well as develop and implement ESG policies and to launch successful ESG financial products.

Please contact us if you have any questions.

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