COURSE ON KEY ISSUES ON THE INTERNATIONAL ECONOMIC AGENDA

Short courses for Permanent Missions in Geneva

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HARNESSING BLOCKCHAIN FOR SUSTAINABLE DEVELOPMENT: PROSPECTS AND CHALLENGES

AGENDA

01 The blockchain technology

02 Blockchain’s ecosystems of innovation

03 Blockchain and SDGs

04 Harnessing blockchain for Sustainable Development

05 International Cooperation

The Blockchain Technology

Bitcoin: A Peer-to-Peer Electronic Cash System

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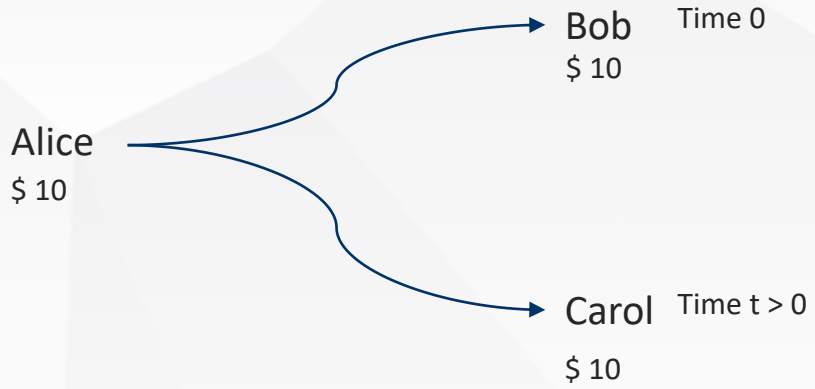
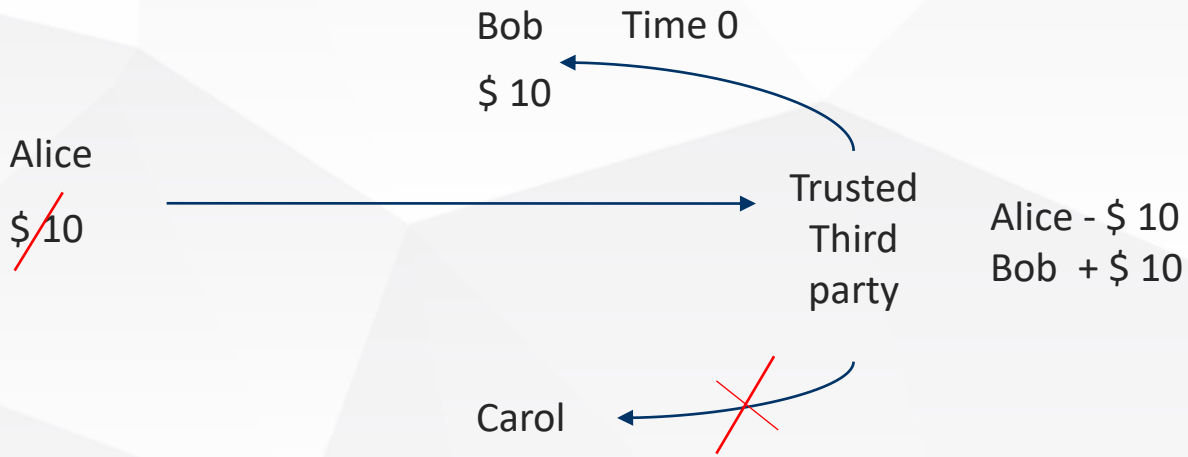
Abstract. A purely peer-to-peer version of electronic cash would allow online payments to be sent directly from one party to another without going through a financial institution. Digital signatures provide part of the solution, but the main benefits are lost if a trusted third party is still required to prevent double-spending. We propose a solution to the double-spending problem using a peer-to-peer network. The network timestamps transactions by hashing them into an ongoing chain of hash-based proof-of-work, forming a record that cannot be changed without redoing the proof-of-work. The longest chain not only serves as proof of the sequence of events witnessed, but proof that it came from the largest pool of CPU power. As long as a majority of CPU power is controlled by nodes that are not cooperating to attack the network, they'll generate the longest chain and outpace attackers. The network itself requires minimal structure. Messages are broadcast on a best effort basis, and nodes can leave and rejoin the network at will, accepting the longest proof-of-work chain as proof of what happened while they were gone.

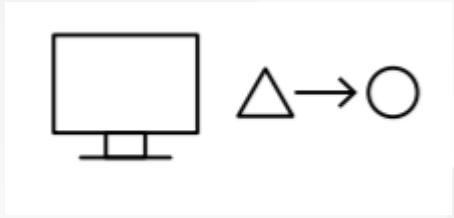
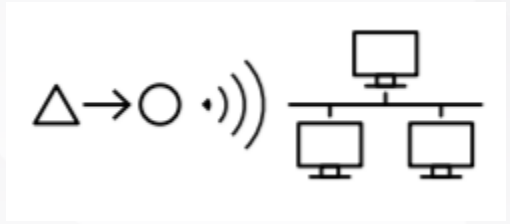
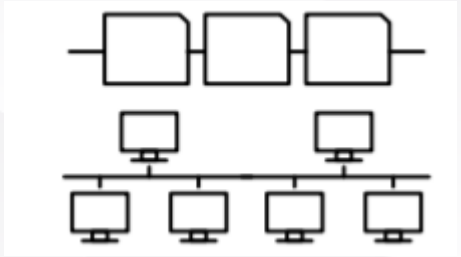
- Blockchain is the technology to implement Bitcoin, but can be used for other applications
- Created of solve a problem:
  - Weakness of trusted third party
  - Increasing transaction costs
  - Fraud is accepted as unavoidable

The double-spending problem





The Blockchain Technology

1	Transaction is submitted to a blockchain		Transactions are constantly being sent to the network by users
2	Network receives the transaction		The transactions are received by computers who verify that the transactions are valid
3	New block created and propagated		One computer then packages the transactions into the next block and sends it out to the network
4	Blockchain updated and transaction completed		The newest block is added to the chain of blocks, and the transactions are confirmed

Source: UNIN (2019), A Practical Guide to Using Blockchain within the United Nation, available at https://atrium.network/guide

The Blockchain Technology

Cryptocurrency

The foundation of blockchain technologies

Cryptocurrency blockchains

Peer-to-peer decentralised cryptocurrency transactions

Proof-of-work (PoW) protocol

BLOCKCHAIN 1.0

Smart Contracts

More financial functionality than simply being a cryptocurrency transactions processor

Decentralized applications (DApps) based on programmable language

Autonomously executing algorithms

Proof-of-work (PoW) protocol

BLOCKCHAIN 2.0

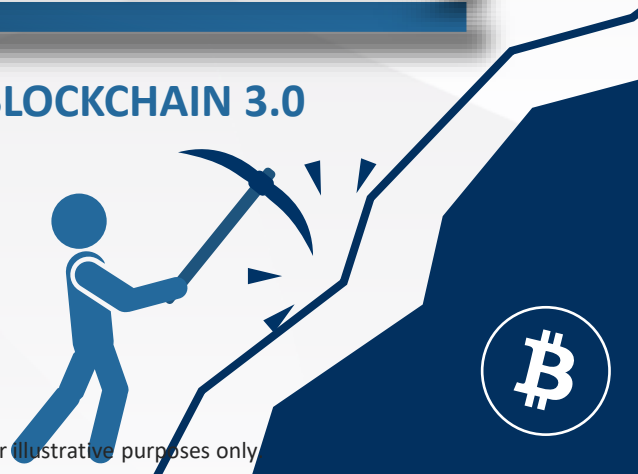
More Functionality

Larger-scale of applications of non cryptocurrency-related Distributed Ledger Technology (DLT)

Improved performance with more scalability and interoperability.

Proof-of-stake (PoS) protocol

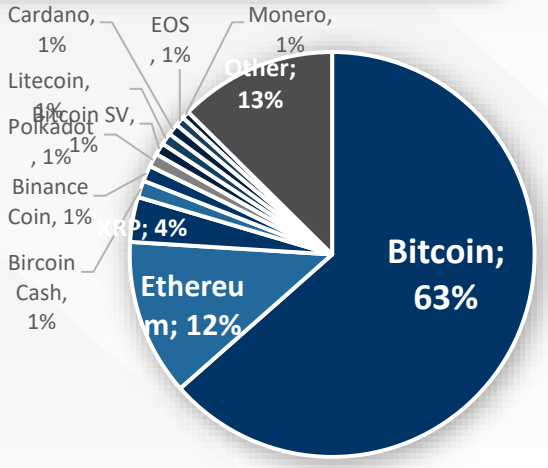
BLOCKCHAIN 3.0



Blockchain's Applications

Cryptocurrencies and online payments

- Over **1,000 cryptocurrencies**
- Total capitalization of over $ 1 trillion



Decentralized Finance (DeFi)

- Financial instruments run by **smart contracts**
- Complex financial use cases without any intermediaries
- In 2020 there were **251 DeFi projects**, 203 were built on Ethereum blockchain, and 26 on Bitcoin. **Examples:**

Chainlink LINK

Uniswap

International trade

Image Credits: cargox.io

Smart contracts allow for **automatic, speedy, and timely issuance of customs invoices, permits, licenses, and certificates triggered after payments of fees and duties**. Numerous companies and governments are already forming consortia and alliances to deploy the blockchain technology in various areas of international trade.

TRADELENS

ASYCUDA world

Value chain

Blockchain can be used to improve the **transparency, traceability and reliability** throughout the value chains by reducing information asymmetries, tracking inventories and ownership rights of products, enabling faster and more cost-efficient delivery of goods, and enhancing coordination between stakeholders.

HYPERLEDGER

Blockchain's Ecosystems of Innovation

Cryptographic innovations

Innovations in algorithm, blockchain, mathematical models, etc

Example: Zero-knowledge proof (ZK-Proof) systems

Layer 1 software infrastructure

Reduce the required crypto skills to program and reduce the risk of faulty crypto implementations

Layer 2 software infrastructure

Decentralized version of an existing centralized application or system

DeFi, International trade, value chains, etc

Hardware

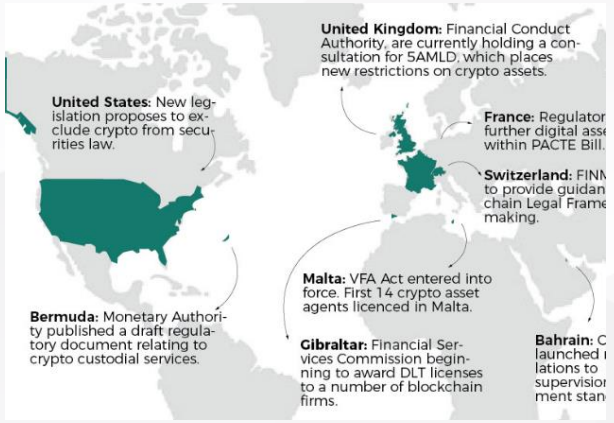
Hardware infrastructure to support the applications

Governance and business models

Governance mechanisms and business models of blockchain solutions, e.g. DAO

Innovations in regulations

Many adjustments are needed in terms of institutions and regulations.



https://www.e-zigurat.com/

Blockchain’s Ecosystems of Innovation

Examples of Blockchain Applications that Contribute to the SDGs

SDG 2: Zero Hunger

Food voucher transfers with blockchain: Building Blocks is a blockchain-based voucher delivery platform created by WFP to simplify voucher transactions by removing the need to create virtual custodial accounts with financial services providers.

SDG 8: Decent Work

Access to interest-free loans using blockchain: the Federal Tax Service (FTS) of the Russian Federation launched a blockchain platform named "MasterChain" to issue interest-free loans to SMEs processing their applications for interest-free loans for the payment of wages.

SDG 10: Ensure equal opportunity

Blockchain-based solution for assessing Internet at schools: UNICEF's Project Connect is a blockchain-based platform to map every school in the world and their connectivity, providing real-time data on the quality of each school's internet connectivity.

SDG 13: Climate Action

Low carbon tea project in Kenya (GLI-TEA): The project deploys the blockchain technology to support the traceability and transparency of both production and emissions of the tea value chain.

The Potential Impact of Blockchain on the Achievement of the SDGs

Forward-looking scenarios

Decentralized applications overtake centralized ones

Applications are developed for **financial inclusion**

Efficiency increases in international digital transactions

Cryptocurrency replaces fiat money

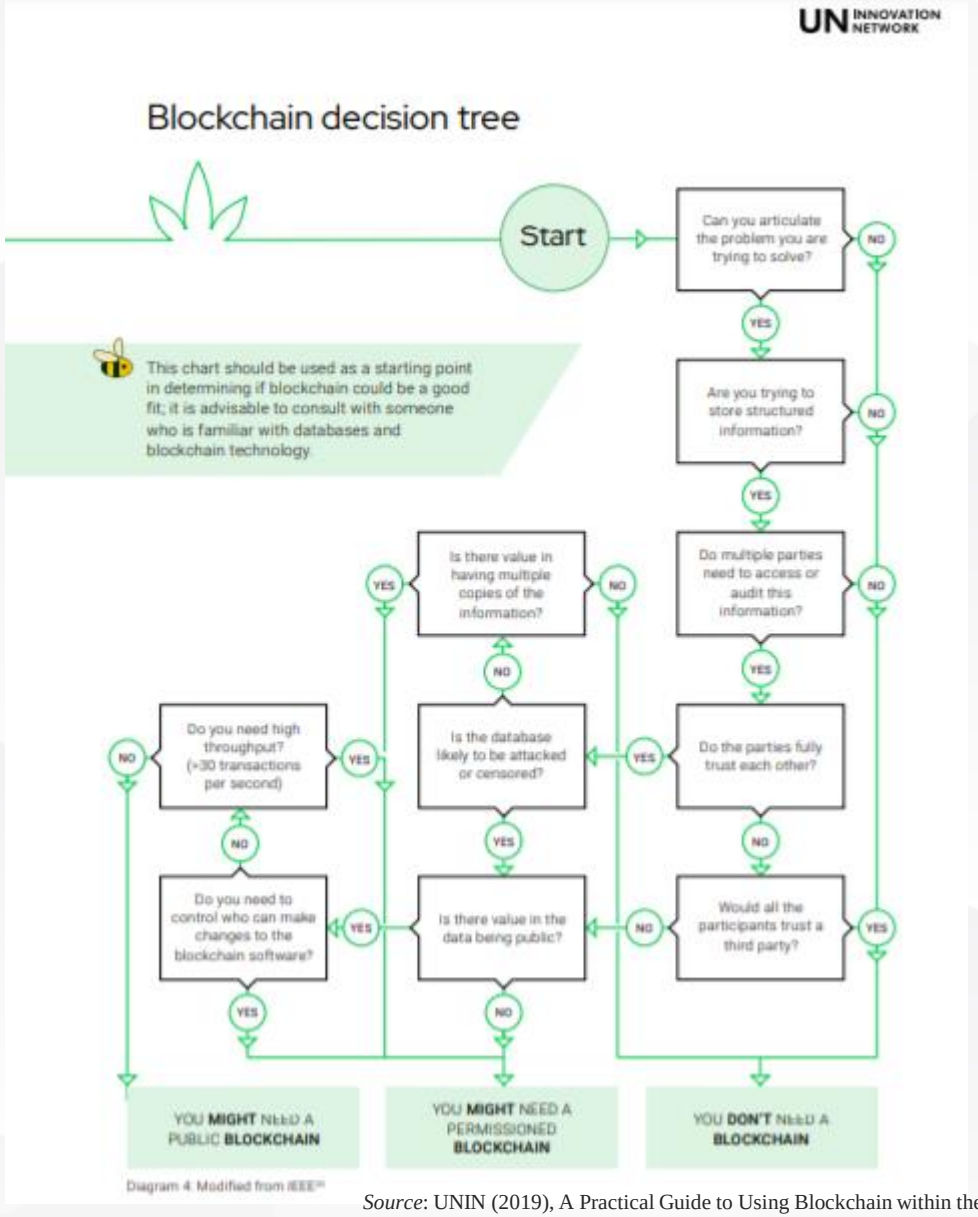
Blockchain becomes the "**new Internet**"

The Potential Impact of Blockchain on the Achievement of the SDGs

Decentralized applications overtake centralized ones

Forward-looking scenarios

- In this scenario, two things must happen: people see centralized applications as risky, and blockchain becomes faster and greener.
- The blockchain's impact on the SDGs → Lower transaction costs, but it is not clear.
- It would still require universal Internet access, digital skills, and laws and regulations related to data privacy and security.



Source: UNIN (2019), A Practical Guide to Using Blockchain within the United Nation, available at https://atrium.network/guide

The Potential Impact of Blockchain on the Achievement of the SDGs

Forward-looking scenarios

Applications are developed for **financial inclusion**

- Blockchain as a tool for financial inclusion: creating blockchain versions of digital money but with lower fees.
- Digital money has the advantage of being easy to use, with a network of agents that manage the cash to digital money exchange.
- Decentralized finance could contribute to financial inclusion, but inclusiveness is not one of the drivers of innovation in this domain.

The Potential Impact of Blockchain on the Achievement of the SDGs

Forward-looking scenarios

Efficiency increases in international digital transactions

- Increasing trade and transport efficiency and reducing costs has the potential to increase trade.
- Who benefits from that increase still depends on many other factors such as the productive structure of countries and the policies in place to harness trade for development.
- The challenges for developing countries to fairly integrate into and benefit from globalization would remain.

The Potential Impact of Blockchain on the Achievement of the SDGs

Forward-looking scenarios

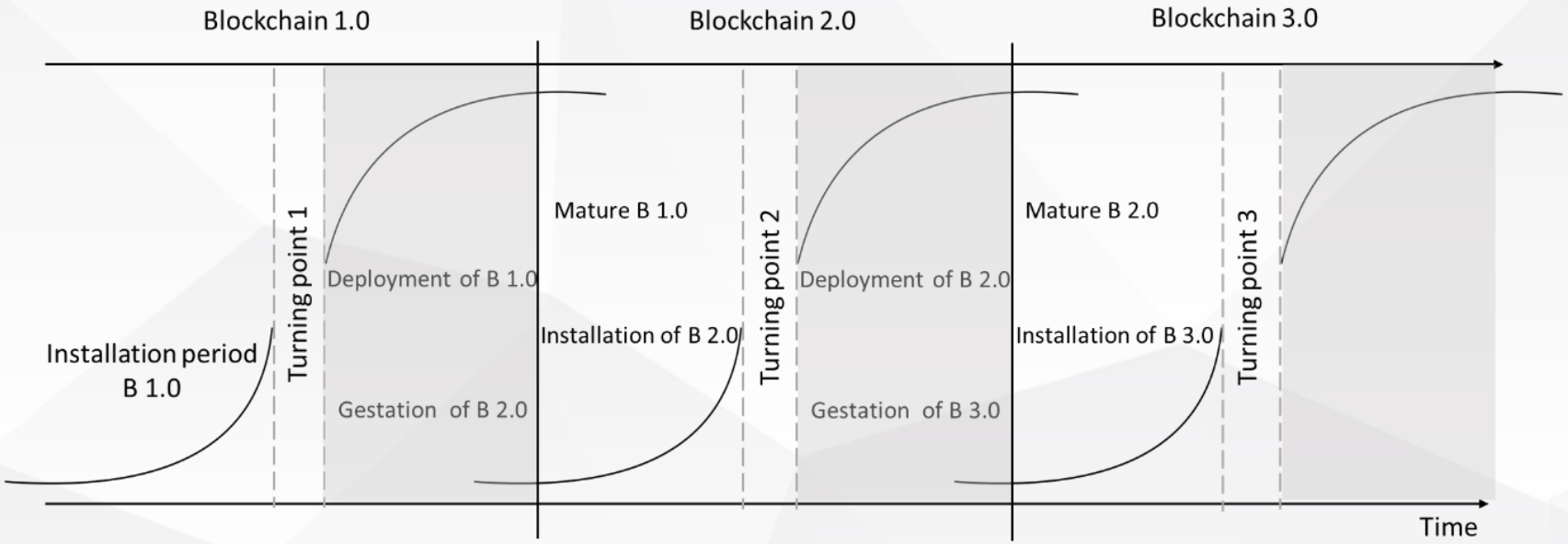
Cryptocurrency
replaces fiat money

- If cryptocurrencies replace fiat money, the impact on the SDGs would be felt through the effect on monetary policy, but currently they have a negligible impact.
- Cryptocurrencies are private money and will have an impact on the ability of central banks to conduct monetary policies
- Stable coins with worldwide expansion expose small and economically weak States to a risk of substitution to their national currencies.

The Potential Impact of Blockchain on the Achievement of the SDGs

Forward-looking scenarios

Blockchain becomes the
“new Internet”



The Potential Impact of Blockchain on the Achievement of the SDGs

Potential unintended consequences

Environment impact

Bitcoin was using as much energy consumption as Switzerland

Inequality

50% of all bitcoin addresses hold less than 0.01 bitcoin, and almost 90% hold less than 1 BTC

Criminal activities

The share of illicit cryptocurrency rose in 2019 to reach 1.1 per cent of all activities (around USD 11 billion).

Privacy

Hackers stole USD 450 million in Bitcoin in MtGox Bitcoin Exchange attack in 2014 and were not identified.

Harnessing Blockchain for Sustainable Development

Low and lower-middle-income developing countries

- Build the basic human capacity and infrastructure, and start pilot projects, that could kickstart the diffusion of blockchain
- Identify and form groups of blockchain experts
- Invest in research institutions and graduate programs in STEM fields
- Establish associations, laboratories, incubators and consultancies for the blockchain industry
- Establish pilot programs to build trust in Blockchain technology
- Integrate blockchain-based services to existing platforms

Harnessing Blockchain for Sustainable Development

Upper-middle income developing countries

- Facilitate the linkages of their national innovation system with the global ecosystem of innovation in blockchain
- Establish a National Blockchain Strategy
- Blockchain incubators, innovation hubs and networks
- Specialized blockchain taskforce and develop blockchain guidelines and principles
- Establish standards for interoperability and identify key use-cases and form strategic collaborations
- Establish channels of collaboration with the international community

Harnessing Blockchain for Sustainable Development

High-income countries

- Develop legal and policy frameworks that allow organizations and the public to benefit from Blockchain technology while minimizing its risks and protecting users
- Establish a Blockchain Development Committee
- Synergy through research and development
- Create innovation incentives, support for new ventures and jobs
- Establish regulatory sandboxes

Harnessing Blockchain for Sustainable Development

Creating the regulatory environment for support blockchain innovation while addressing potential risks

Privacy security and data protection

Concerned on the processing of personal data across geographical boundaries would be common practice.

Financial regulations

The absence of an international convention for regulating blockchain in financial markets, could potentially be problematic.

IP regulations

The relationship between blockchain and intellectual property (IP) rights can be viewed from two perspectives: from the developer end, and from the user end.

International collaboration

Share knowledge and and research

1. Coordinate awareness-raising
2. Blockchain Innovation Strategy Assessments

Build capacity of governments

1. Training programmes
2. Know-how transfer programs
3. Decision-making tools

Set guidelines, norms, and standards

1. Promote the development of standards, recommendations, and regulations
2. Intergovernmental consensus-building

Use blockchain in the UN operations

1. Continue exploring the use of blockchain in projects implemented by the UN system
2. Establish a partnership's framework
3. Share know-how, and experiences

Questions for Discussion

SOLUTIONS?

1. How could governments better support the creation or strengthening of ecosystems for blockchain innovation?
2. How can STI policies ensure that unintended consequences of blockchain development and deployment are addressed?
3. What are the actions that the international community can take to contribute to maximizing the benefits associated with blockchain innovation and to mitigate its risk?

Conclusions

Key messages

- Blockchain has the potential contribute to **sustainable development**, but at this moment, innovation has focused on **financial applications**
  - For most of the innovations in this field, the goal is **speculative gains in crypto-financial assets** → financial bubbles and bursts
  - Blockchain may potentially increase **automation and the integration of physical and virtual worlds**.
  - **Past technological revolutions** offered windows of opportunity for some developing countries to catch up and others to forge ahead.
- Governments of developing countries should seek to **strengthen their innovation systems** to strategically position themselves to benefit from this new wave of technological change.

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Issues Paper: https://unctad.org/system/files/information-document/CSTD2020-2021_Issues02_Blockchain_rev_en.pdf

HARNESSING BLOCKCHAIN FOR SUSTAINABLE DEVELOPMENT: PROSPECTS AND CHALLENGES