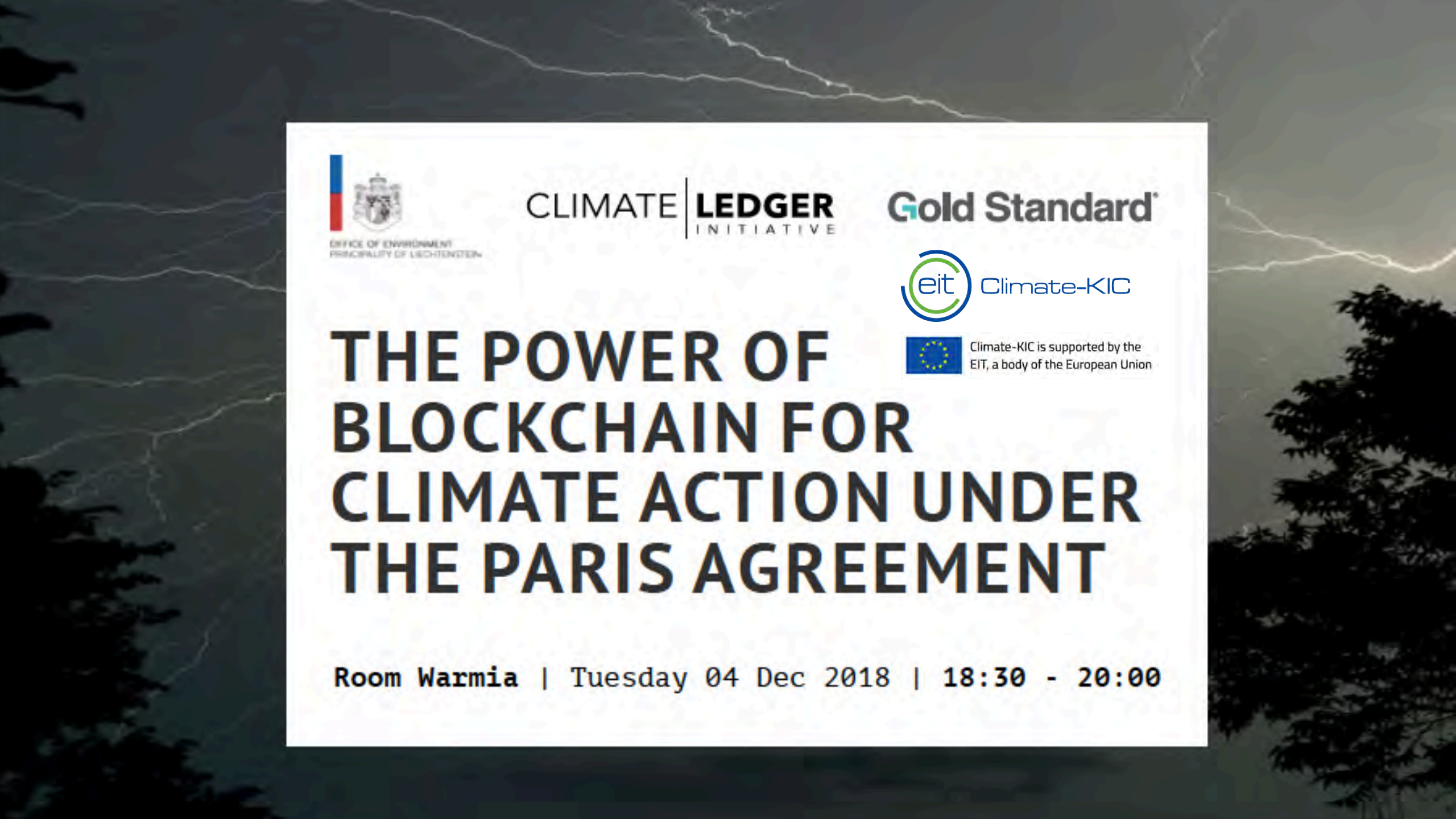
OFFICE OF ENVIRONMENT
PRINCIPALITY OF LIECHTENSTEIN
CLIMATE LEDGER INITIATIVE
Gold Standard
eit Climate-KIC
Climate-KIC is supported by the EIT, a body of the European Union
THE POWER OF BLOCKCHAIN FOR CLIMATE ACTION UNDER THE PARIS AGREEMENT
Room Warmia | Tuesday 04 Dec 2018 | 18:30 - 20:00

PROGRAM

Heike Summer, Office of the Environment, Liechtenstein	Welcome and introductions of panelists
Antonia Sutter, Swiss Development Cooperation (SDC), Switzerland	Blockchain from a development agency perspective
Juerg Fuessler, INFRAS + Climate Ledger Initiative (CLI) **Felipe De León**, Consultant and Adviser to the Ministry of Environment and Energy (MINAE), Costa Rica **Sven Braden**, LIFE Climate Foundation + CLI	Launch of Navigating Blockchain for Climate Action Presentation of key concepts for policymakers: • Blockchain technology + needs of PA operationalisation • Article 6/networking markets • Digitising MRV • Supply chain applications
Nick Beglinger, Cleantech21, Hack4Climate + CLI **Sven Braden**, LIFE Climate Foundation + CLI	Innovations: • Use cases in REDDchain; RE + Hack4Climate • Wood tracking protocol • IXO Protocol
Alain Patrick Medenou, UNFCCC Secretariat	UNFCCC work on blockchain
Sarah Leugers, Gold Standard, CLI	Facilitated roundtable discussion / Audience Q&A

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BLOCKCHAIN + PARIS AGREEMENT

Juerg Fuessler
INFRAS
Climate Ledger Initiative

eit Climate-KIC

Climate-KIC is supported by the EIT, a body of the European Union

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Mission: To accelerate the momentum for climate action under the Paris Agreement by fostering the use of the emerging blockchain technology.

Activities:

- **Analysis and research**
- **Innovation use cases**
- **Platform for exchange and joint learning**

Supported by Government of Switzerland, the Government of Liechtenstein and EIT Climate-KIC

Collaboration with network including UNFCCC Sec. and World Bank

Founding member of the Climate Chain Coalition

Operated by: Cleantech21 Foundation, LIFE Climate Foundation, INFRAS and the Gold Standard Foundation

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Blockchain Technology and the World Economy

2015

2016

42 Financial Intermediates start bc based collaboration

2017

WORLD ECONOMIC FORUM

«By 2027 about 10% of World GDP will be stored on blockchains»

Blockchain Technology – What is it?

- A **new kind of decentralized database**;
- Data is not stored centralized but distributed over many participating computers;
- In principle, all transactions in the network are transparent for its participants;
- All data base entries («blocks») are linked using cryptographic processes therby creating an immutable chain of data blocks;
- All participants continuously monitor and record transactions and check database records for coherence;
- This process is automatized through a network protocol – similiar to HTTP.

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Blockchain Technology accelerating the implementation of the Paris Agreement and the UN Sustainable Development Goals (SDGs)

Source: UNFCCC.int

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The Paris Agreement and Blockchain Technology

Characteristics of Paris Agreement

- De-centralized, *hybrid* bottom-up *and* top-down approach
- **Transparency** as key pillar of PA
- Important role of measuring, accounting, tracking, reporting
- **Exchange of information** and review
- Important role of **private sector players**

Risks: Lack in ambition levels and transparency

Features of Blockchain/DLT Technology

- De-centralized notary, also for small systems
- Brings trust to peer-to-peer interactions
- Accessibility and distributed systems
- Increased transparency
- Permanent ledger
- Efficiency – Smart contracts
- Public / permissioned blockchain

Risks: pilot/ demonstration stage, complex, high power consumption, only a hype?

Source: Climate Ledger Initiative

CLI Report - Navigating Blockchain and Climate Action

Why?	Huge Amount of dispersed information available, primarily on individual use cases, start ups, ICOs. Need for an objective overview and mapping of **climate-related initiatives**, applications and policies.
Who?	Contributions from Governments, Multilateral Organizations, Non-Governmental Organizations and Private Sector: 17 lead authors and more than 20 reviewers from over 20 different countries
Whom?	Report is addressed for a non-technical audience within the climate community, e.g. for policy makers, interested practitioners
What?	Report provides an overview and orientation of blockchain development (and within the broader field of DLT) which are relevant for the implementation of the Paris Agreement.
When?	Official launch on December 4th 2018, COP24 in Katowice. The field is rapidly developing, therefore CLI plans to update the report on an annual basis.
Where?	www.climateledger.org

CLI Navigating Blockchain and Climate Action Report

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Content in three Parts:

	Chapter	Author(s)	Institution
	PART 1: Blockchain for the Paris Agreement and Compliance		
1 2	Introduction – setting the scene The Paris Agreement – a bird's eye view	J. Fuessler	INFRAS & CLI
3	Blockchain supporting a hybrid, decentralised climate treaty	Felipe De León	MINAE, Costa Rica
4	Networking carbon markets to scale up climate action	Rachel Wok, Susan David Carevic, Andrea Prada H	The World Bank
5	Measuring, reporting and verification	Owen Hewlett	The Gold Standard & CLI
6 7	Accounting for climate finance Tracking climate adaptation measures and their impacts	Cristian Retamal, Iván Razo-Zapata, Gustavo Arciniegas López	COCOA

CLI Navigating Blockchain and Climate Action Report

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	Chapter	Author(s)	Institution
	Part II: Blockchain for implementing climate action		
8	Engaging corporations and Individuals	Massamba Thioye	UNFCCC Secretariat
9	Combining innovative carbon taxation and blockchain	Nick Beglinger	Cleantech21, Hack4Climate & CLI
10	Crowd financing for climate action, role of tokenisation	Sven Braden	LIFE Climate Foundation & CLI
11	Blockchain technology as a driving force for renewable energy development	Christian Hübner	Konrad-Adenauer-Stiftung, Peru
12	Blockchain for corporate climate and sustainability	Marion Verles	The Gold Standard & CLI
	Part III: Good blockchain		
13	What blockchain technology is and how it works	Sven Braden Madeleine Guyer	LIFE Climate Foundation INFRAS & CLI
14	Governance for blockchain and climate action	Juerg Fuessler	INFRAS & CLI

Thank you.

Juerg Fuessler
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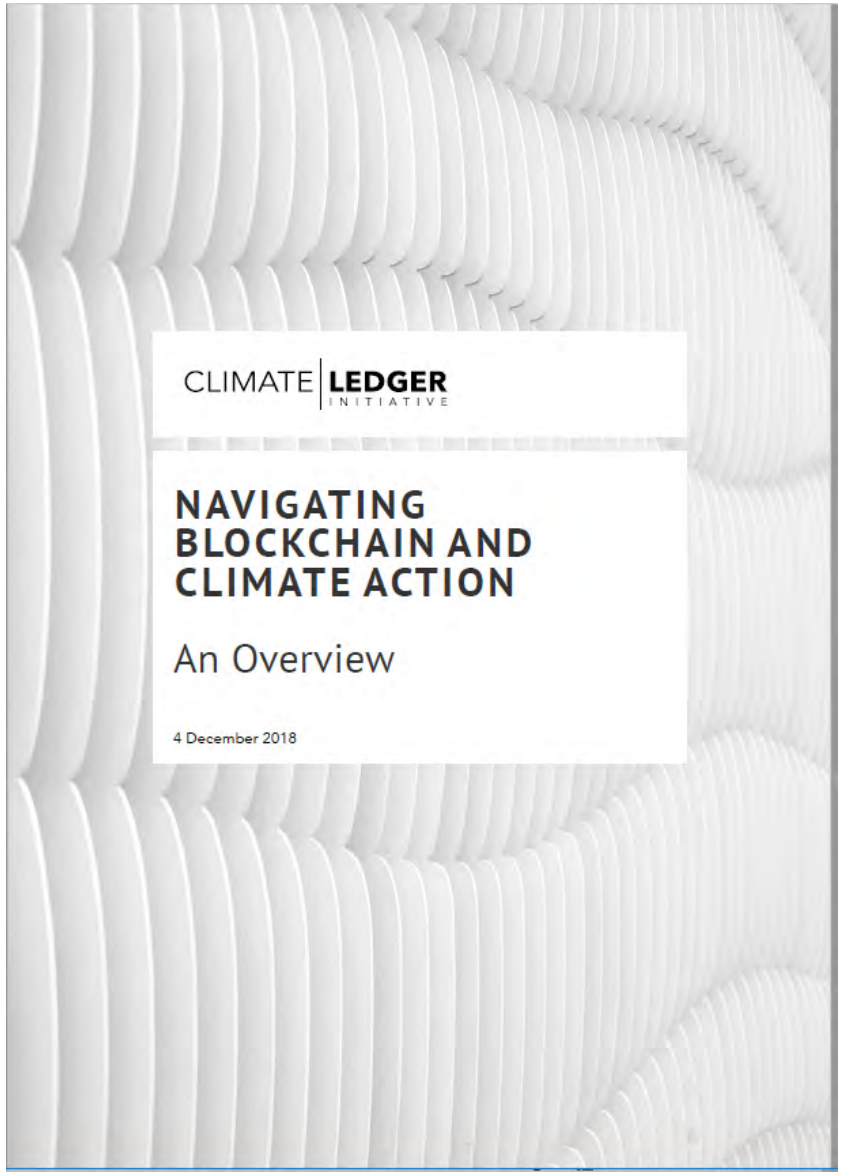

Next side event:
Unleashing the potential for climate mitigation and adaptation action with blockchain technology
EU Pavilion, COP24
Wednesday 05 December 2018
18:30 - 20:00

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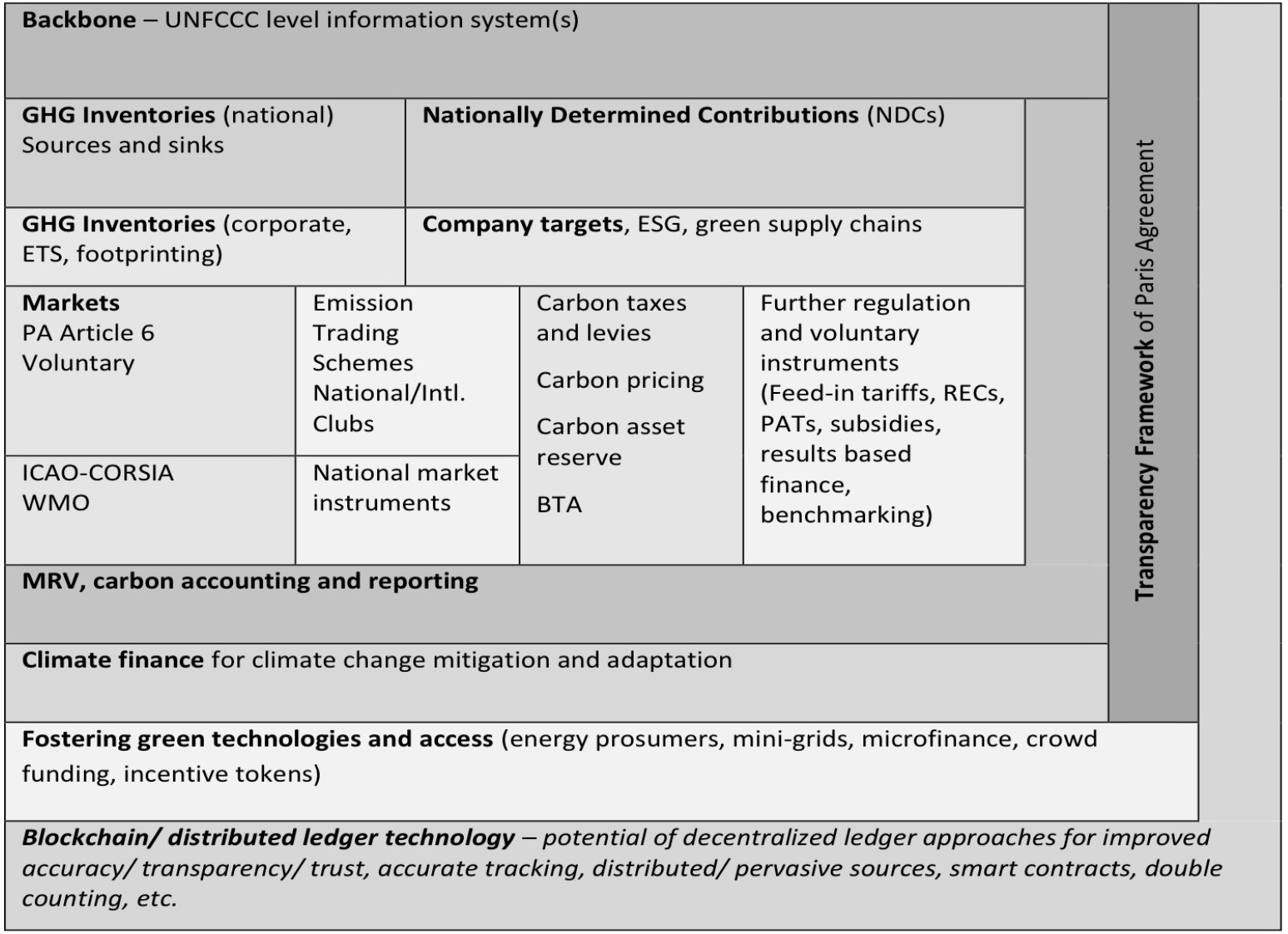
REPORT HIGHLIGHTS

Sven Braden
LIFE Climate Foundation Liechtenstein
Climate Ledger Initiative

The Paris Agreement and Blockchain Technology– shared characteristics



Source: ***Climate Ledger Initiative.***

Abbreviations: GHG: Greenhouse gases, ETS: Emissions Trading Schemes, ESG: Environmental, Social and Governance Criteria in the Finance industry, PA: Paris Agreement, ICAO-CORSIA: The International Civil Aviation Organization's Carbon Offsetting and Reduction Scheme for International Aviation, WMO: World Maritime Organization, BTA: Border Tax Adjustments, REC: Renewable Energy Certificate, PAT: Perform Achieve Trade Scheme for Energy Efficiency in India's Industry, MRV: Measuring, Reporting and Verification.

Outline

- Example 1 Art. 13 PA, Measuring, reporting and verification of and tracking mitigation activities
- Example 2 Art. 9 PA, The role of blockchain and its potential for climate finance
- Example 3 Role of blockchain in corporate sustainability

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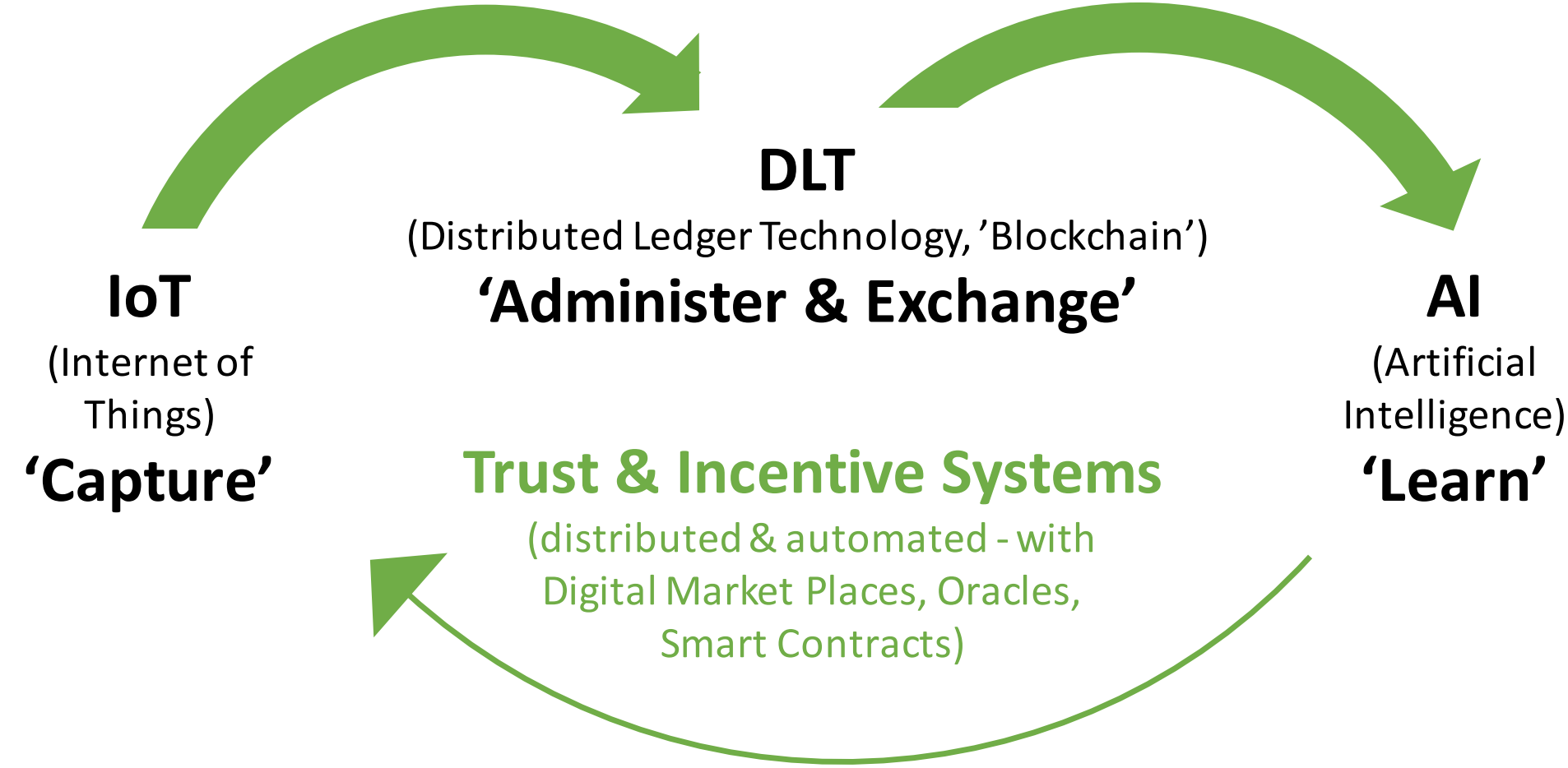
Ex: Art. 13 PA, MRV and tracking mitigation activities, managing project cycle



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Examples

Art. 13 PA, Measuring, reporting and verification of and tracking mitigation activities, managing project cycle

Challenges in MRV	Opportunities for blockchain	Remarks
Lack of trust in data, forgery	**Increased confidence** in, transparency and accuracy of MRV Reduced potential for human error or corruption in data collection and reporting as well as verification	**Avoiding "garbage-in, garbage-out"** is key! **Simplification** of ways to establish the origin of data and how it has been collected and verified **via automated systems** for collection, recording and cross-checking.
Costly, complex **collection of data** for individual and dispersed mitigation action	**Automated** collection of data through IoT, recorded and made **immutable by blockchain**	The automated collection, upload of data and the calculations needed to determine impact reduces the need for manual interventions in both collection and review and **speeds up the process of data verification**.
Costly, complex impact quantification and **reporting**	**Smart contract and online applications in conjunction with blockchain** to automate the process of impact calculation, based on automated data collection and **pre-set methodological approaches**	The digitisation of methodologies to calculate emission reductions will require to adapt existing methodologies to be embedded in a blockchain system in the form of smart contracts; some requirements may no longer be relevant, **new requirements may be needed to ensure the appropriate use of technology**.
Automated quality assurance and quality control (**QA/QC**)	Smart contracts on blockchain to automatically check monitoring data for plausibility and outliers	**Data** that does not pass the quality check may be **automatically removed** from issuance **or switch** to more conservative methodology.
Costly verification of emission reductions	Efficiency gains in verification including **crowd verification** and smarter, risk-based selection of what to audit and when; potential to **pre-condition verification based on wider data** to automate much of the process, **use of blockchain's notary function**	This **implies a gradual switch** from verification of each calculation **to the verification of the technology system that produces the output**.

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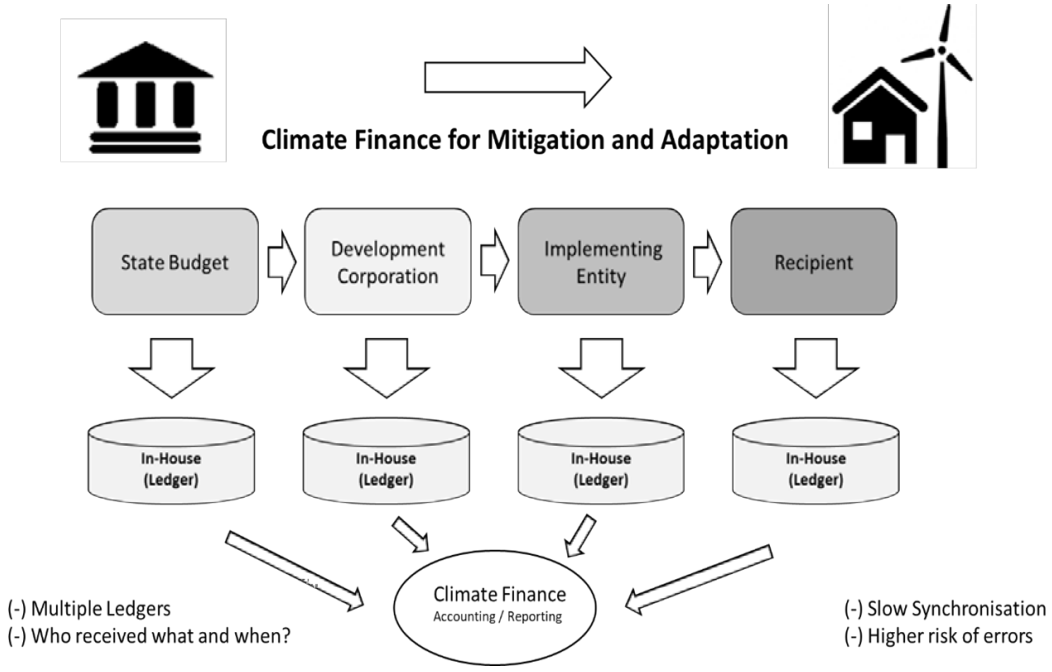
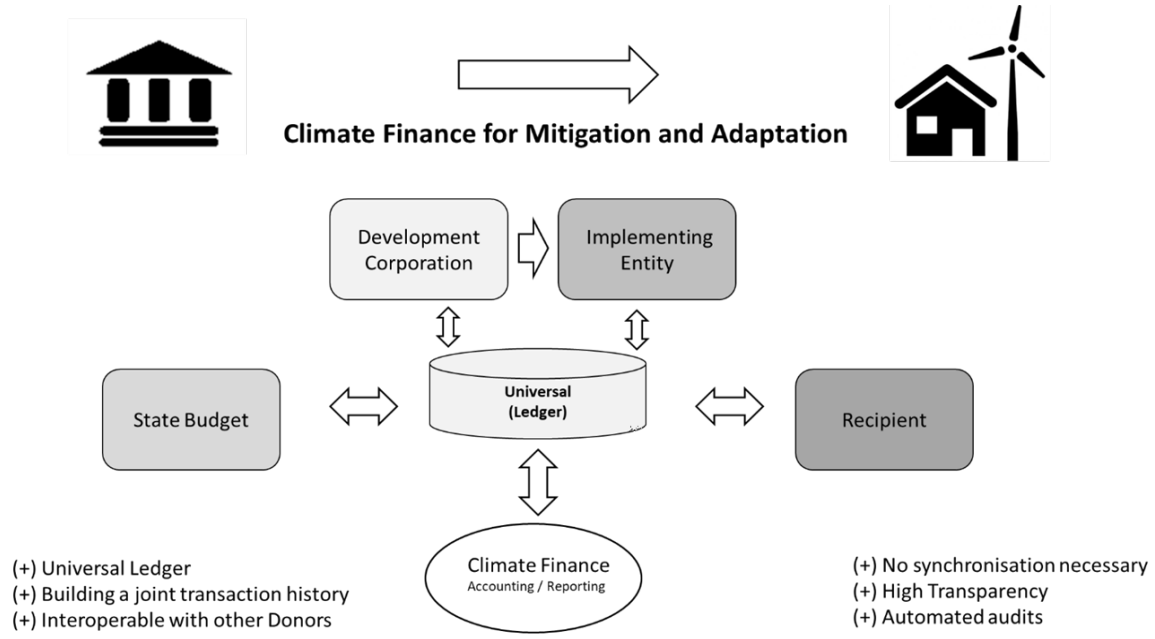
Examples

Art. 9 PA, The role of blockchain and its potential for climate finance



In-House Ledger



Universal Ledger

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Examples

Art. 9 PA, The role of blockchain and its potential for climate finance

Challenges	Opportunities for blockchain	Remarks
Reconciling climate finance **spending** and host country attribution	**Automated tracking and reporting** of financial flows from donors to recipients	Smart contracts can help automate reconciliation if they are designed to analyse and report on financial transfers.
Rules for transparency framework and reporting **not yet developed**	Allowance for **developing bottom-up systems** where actors in the whole chain of climate finance flows adopt innovative blockchain approaches for best practice in reporting and transparency	This requires schemes to fully **share** best practices, **open-source** development, and **open data**.
Donor and beneficiaries **lack mutual trust** in data, risk of forgery	Trusted transfer of financial resources **Increased confidence in and accuracy of** emission-relevant **data** on climate finance	Blockchain must able to track how fiat money and/or cryptocurrencies are spent on climate actions.
Recipients **lack bank accounts**	**Identification** mechanisms to assure **digital identity** of recipients on blockchain; Provision of cryptocurrency for countries with weak monetary systems	Tellers might be required to facilitate exchanges.
Reporting and transparency under Paris Agreement	**Tamper-proof single point of truth** that records all information on financial and technology transfers as well as non-refundable funds for technical assistance	Reporting requires defining smart contracts. Transparency relies on what must be recorded in the blockchain.

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Examples

Role of blockchain in corporate sustainability

← Blockchain solutions for traceable, immutable impact data →

Source: Gold Standard Foundation

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Examples

Role of blockchain in corporate sustainability

Challenges in corporate sustainability	**Opportunities for Blockchain / AI / IoT**	**Remarks**
Managing and **automating supplier data**	**Data input enabled across a large network of** internal and external **stakeholders**; automated **identification of users**; enhanced data security; **increased data quality** from IoT solutions and 'Big data'; data verification and **analysis** supported by AI	Especially relevant in the context of supply chains where suppliers may not necessarily trust each other but are required to share data
Quantifying impacts	Translating paper based, impact quantification methodologies into smart contracts and apps to convert dataset into a **quantified impact that can be validated by the network** and certified by an external third party	Helps **to quantify and certify the sustainability profile of goods** purchased and transacted
Reporting progress	Credible, **transparent reporting** via impacts **stored on the blockchain** to leverage data submitted by **multiple actors** and produce a consolidated picture of a product or a corporate sustainability profile	Responds to growing need for transparent disclosure of sustainability attributes at company- and product-level
Ensuring **traceability of goods**	Goods, services and their associated impacts **digitised and traded** on the blockchain transparently and securely	Significant **existing gap** in ability to translate input / production data into credible impact **information to generate the full "impact profile" of a commodity**
Creating **business** value	**Tokenisation** of impacts associated with goods and services to **unlock monetisation opportunities**	Need to properly design the ecosystem to **create incentives for users** to exchange and **value tokens**

CLI-Report – Key Findings on the role of blockchains

- Digitising Measuring, Reporting and Verification (MRV)

  Blockchain is **part of an ecosystem** of digital technologies including **remote sensors, internet of things, big data and artificial intelligence**. Digitisation of MRV allows the coding of methodologies and processes in the form of smart contracts for the automated issuance, transfer and payment of climate outcomes: Highly relevant for **carbon markets** or **results-based finance schemes**.

- Decentralised access to climate finance

  Bottom-up development of Blockchain approaches **to integrate stakeholders** into the whole climate finance value chain; Blockchain technology combined with new fingerprint, iris or face recognition technology **allow individuals who lack identity documents or bank account to access climate finance** in the form of micro credits, subsidy schemes of payments for mitigation or adaptation action.

- Corporate Sustainability / Supply Chains

  Decentralized Blockchain networks provide for the opportunity to transform **sustainability aspects** (e.g. impact) into fungible tokens – which makes overall corporate sustainability more transparent, tangible **and** can **unlock considerable monetization opportunities**.

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INNOVATION/USE CASE

Nick Beglinger
Cleantech21, Hack4Climate
Climate Ledger Initiative

Cleantech21

#Hack4Climate

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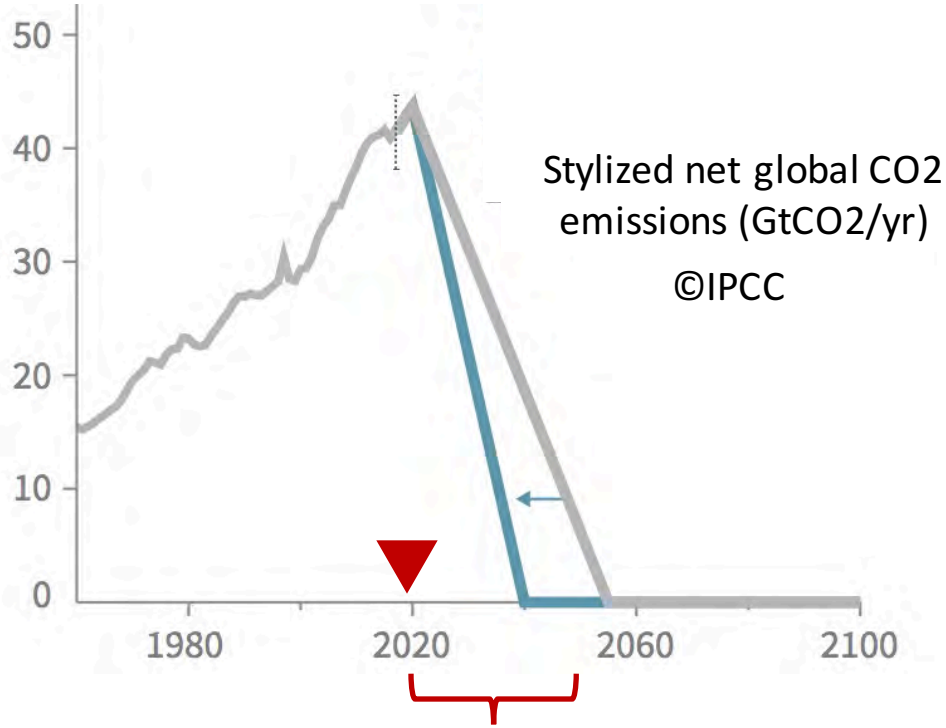
CLI Side Event

(@COP24, 04/12/2018)

Climate Change: Exponential Action Needs Exponential Innovation

('disruptive' to implement Paris Agreement, for business & government)

Challenge: Exponential decarbonization



Stylized net global CO2 emissions (GtCO2/yr)

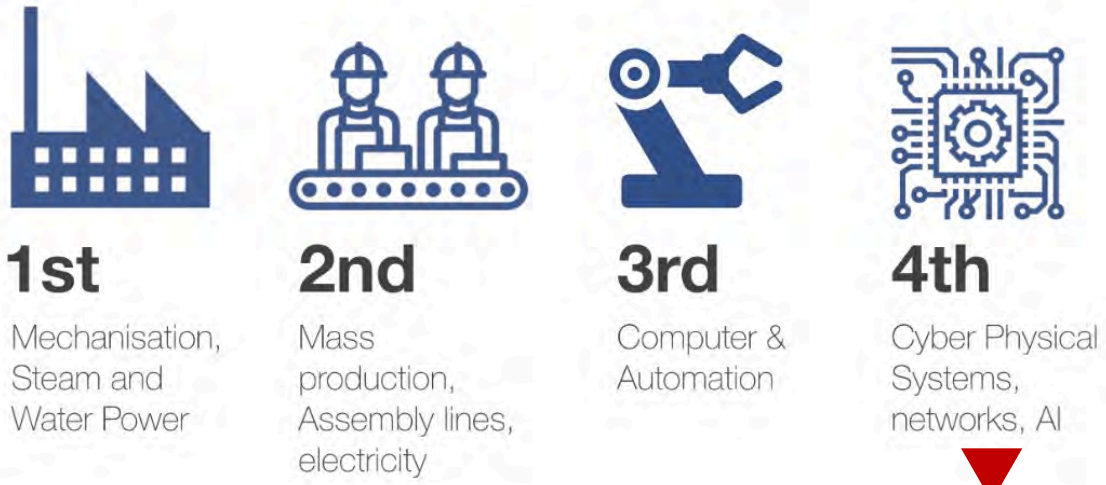
©IPCC

30 years to net-zero!

Source:

http://www.ipcc.ch/report/sr15/

Solution: Fourth Industrial Revolution



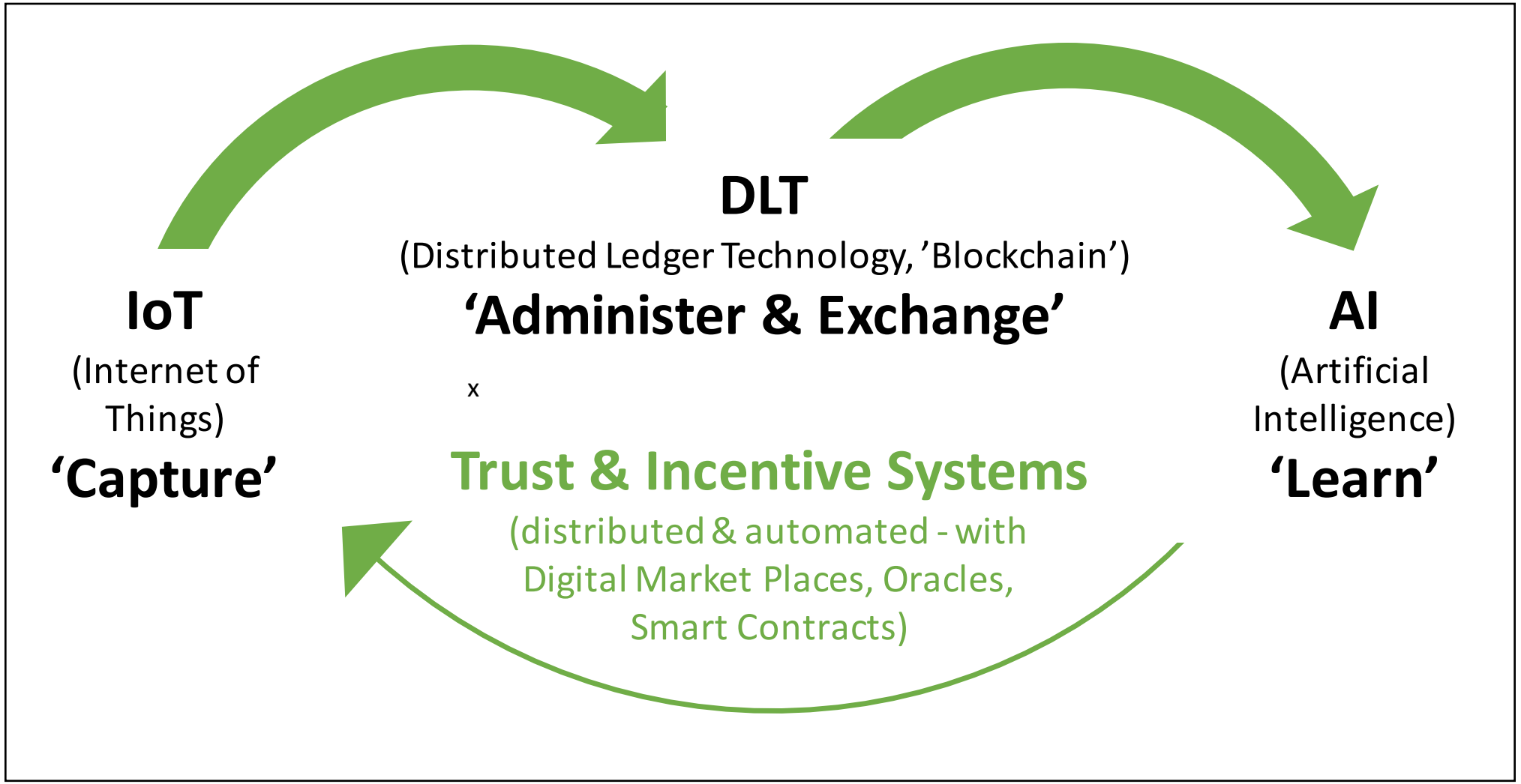
Now!

Note C21 Whitepaper:

'A climate innovation perspective on the fourth industrial revolution'

IoT, DLT & AI - the Disruptive Troika

(exponential innovation, focus continued/confirmed, use case experience)



#Hack4Climate, first pilot COP23, Climate Action Success

(100 hackers from 33 countries, 40 experts, 5 days – use case experience)

"My COP highlight"
James Close, ***World Bank***

After-movie…

Cleantech21
United Nations Framework Convention on Climate Change
CONNECT 4CLIMATE
CLIMATE LEDGER INITIATIVE
giz
IOTA
CHILDREN'S INVESTMENT FUND FOUNDATION
Centre for International Governance Innovation
CONSENSYS
Microsoft
SBB CFF FFS
everledger
Partners Group
WASION
ETH zürich Computational Social Science
DB
innogy
Climate-KIC
Deutsche Telekom
CONTEXTLABS
MIT MEDIA LAB
FuturICT 2.0
XTECH
ROCKY MOUNTAIN INSTITUTE
Gridgularity
HACKERBAY
BIGCHAINDB
ValidityLabs
ENERGY WEB FOUNDATION
FinTech4Good
IMPACT HUB
rockstar* RECRUITING

"A truly inspiring event"
Michael Casey, ***MIT***

From Hackathon to Innovation Program

(approach works, needs more – definition/hack/accelerator)

Use Case Example REDD-Chain (Forest Management, 'digital MRV' applied)

1. **Distributed Ledger**
(DLT, registry, data/access layers)

3. **Sensing**
(IoT, remote & local combined sources)

5. **Impact Analysis/Verif.**
(automated, multiple sources, veracity – AI)

7. **REDD+ Processes, Etc.**
(new 'standards', new projects/products)

2. **Predictive Analysis**
(AI – past patterns for future predictions)

4. **Local Engagement**
(web app, capturing & rewarding – IoT, DLT)

6. **Smart Contracts**
(DLT, automated & results-based actions)

8. **Tokenization**
(democratizing access, tradeable, DLT)

Cleantech21 #Hack4Climate Quantis GAINFOREST EKOFOLIO eit Climate-KIC

Pilot, Q1 2019

H4C @COP24, Second Pilot Year

(in Katowice, Poland 09-13/12/2018)

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USE CASES

Sven Braden
LIFE Climate Foundation Liechtenstein
Climate Ledger Initiative

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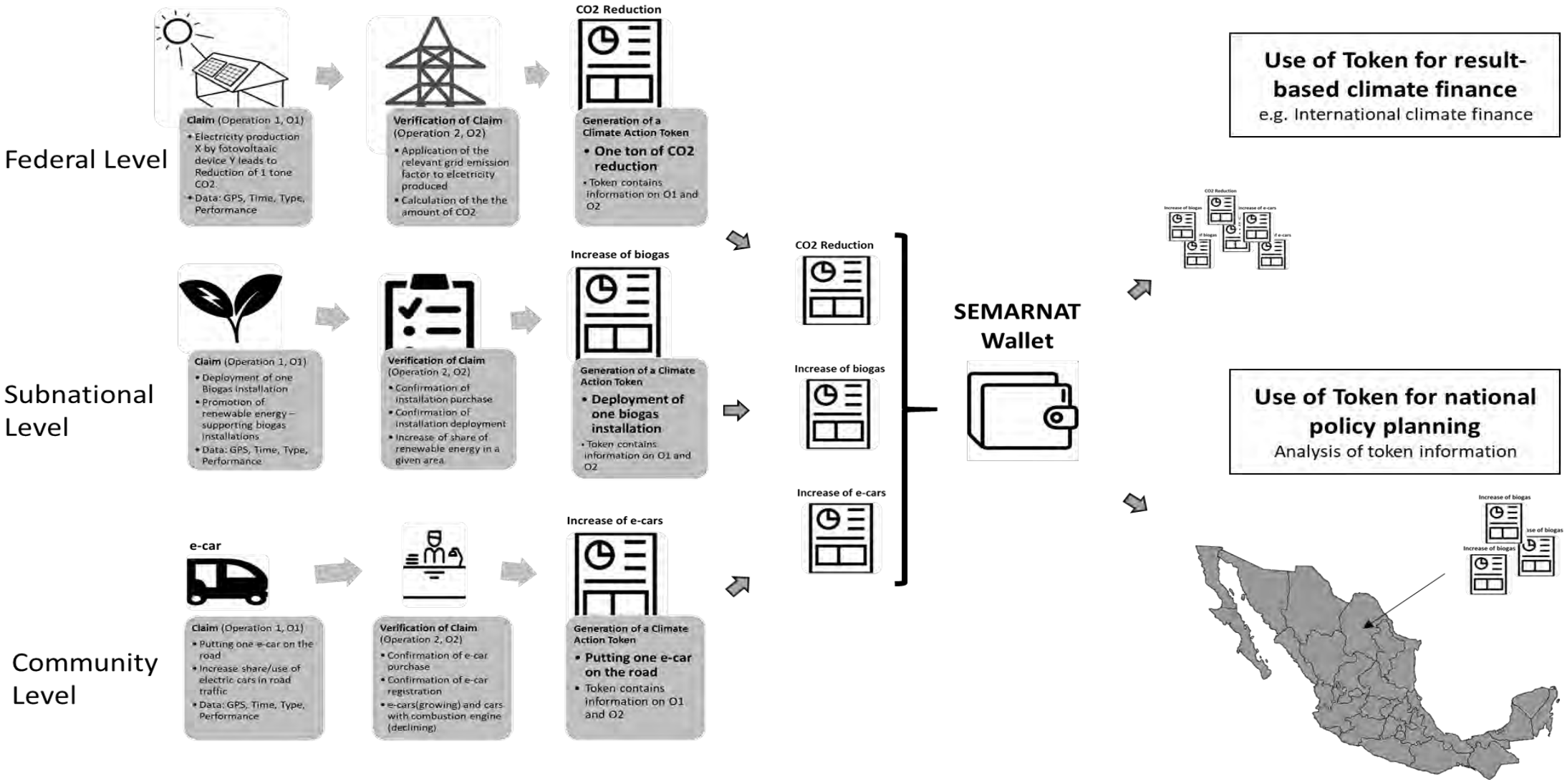
Use Cases – VERIFICATION PLATFORM (GIZ Mexico)



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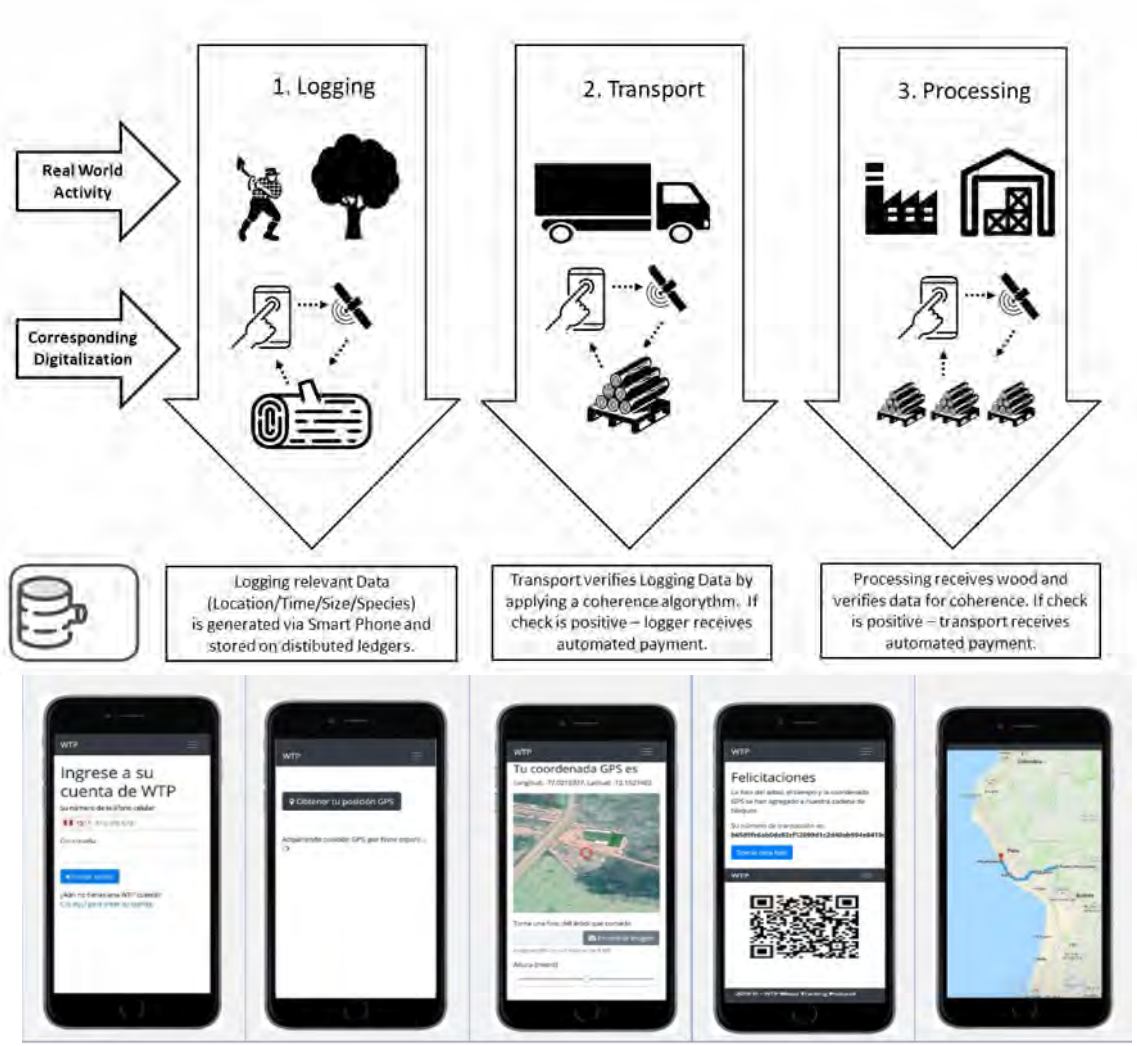
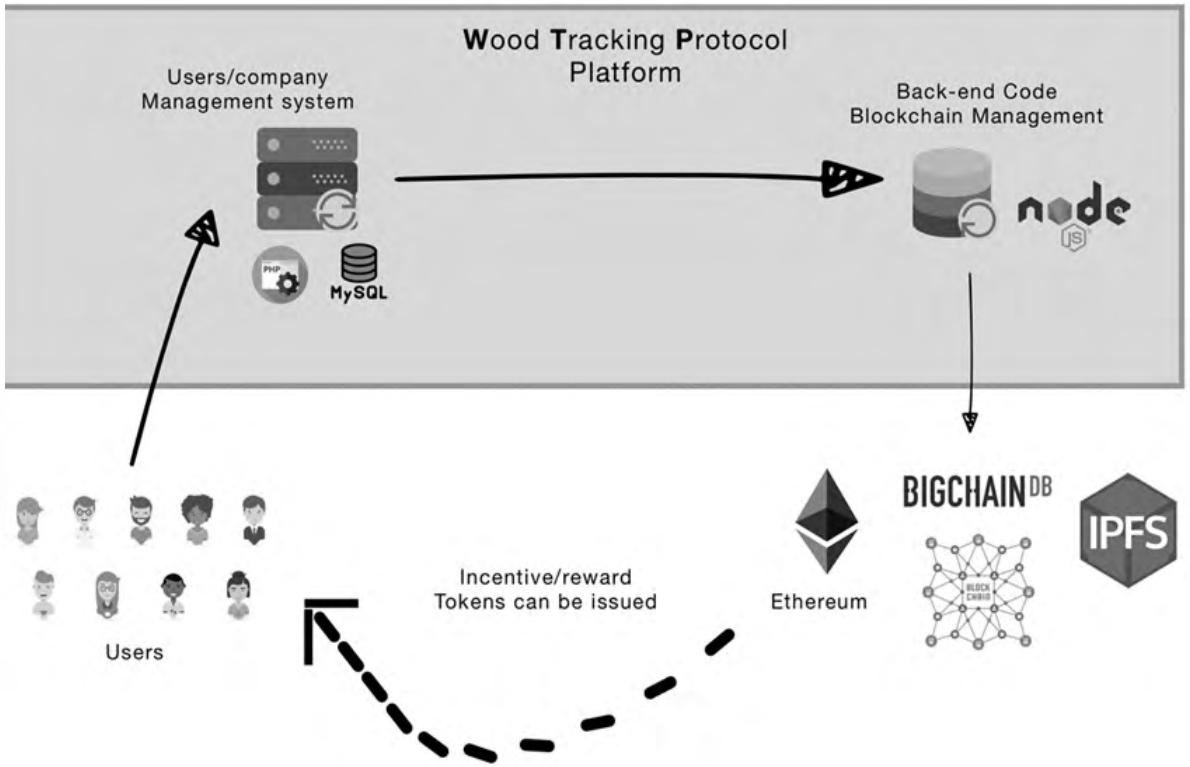
Use Cases – WOOD TRACKING PROTOCOL (DEZA Peru)





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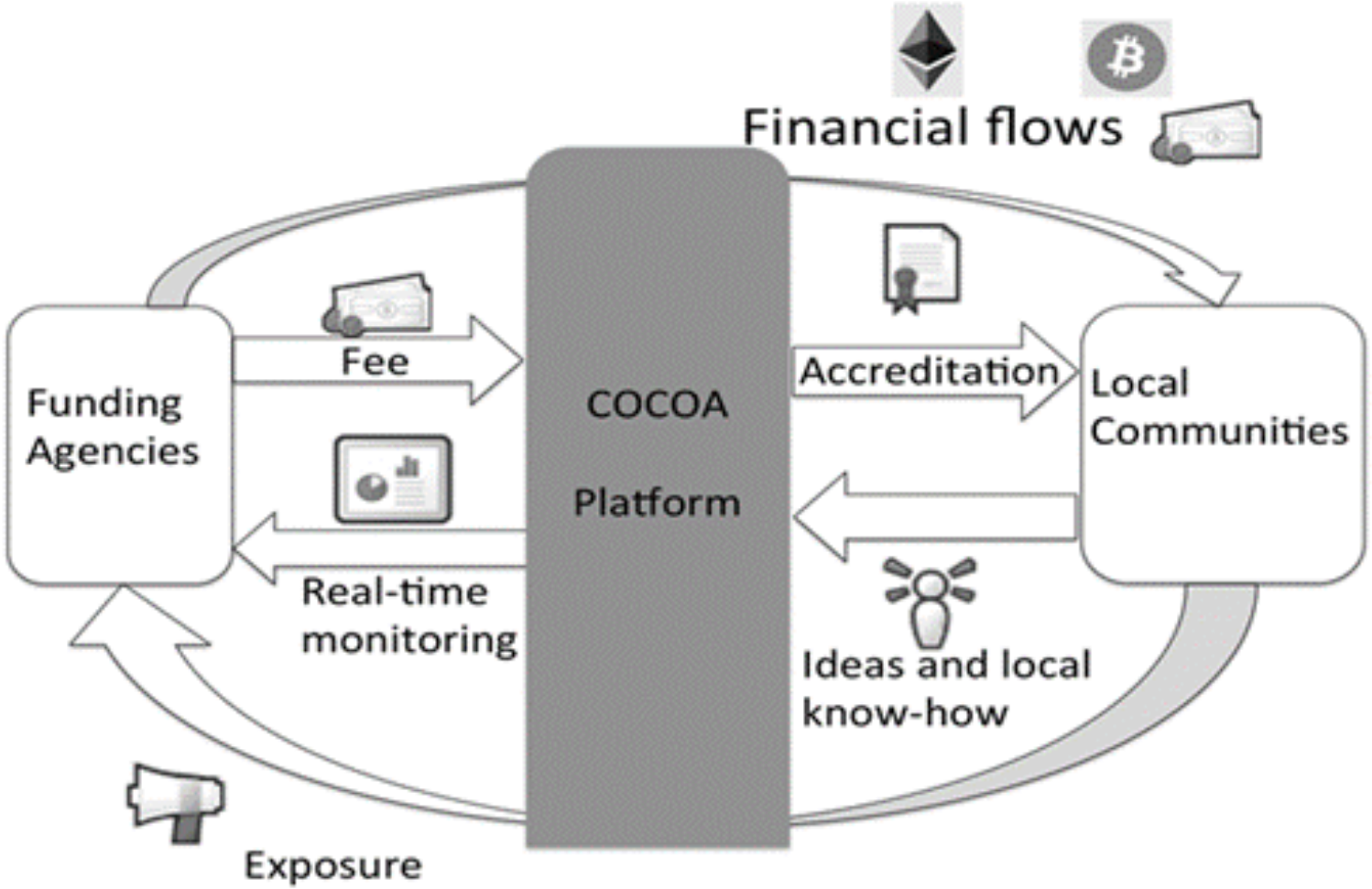
Use Cases – COCOA Platform for community-based adaptation



- Focus on climate adaptation
- Realtime tracking the of financial and other resources
- Tracking progress of initiatives with real-time monitoring
- Strengthening of local PPP initiatives
- Reduction of time and transaction costs during project implementation

PANEL

- **Antonia Sutter**, Swiss Development Cooperation (SDC), Switzerland
- **Juerg Fuessler**, INFRAS + Climate Ledger Initiative
- **Felipe De León**, Consultant to the Ministry of Environment and Energy (MINAE), Costa Rica
- **Sven Braden**, LIFE Climate Foundation + CLI
- **Nick Beglinger**, Cleantech21, Hack4Climate + CLI
- **Alain Patrick Medenou**, UNFCCC Secretariat
- **Kwon Sei-joong**, Director General for Climate Change, MOFA Foreign Affairs, Korea
- Moderated by: **Sarah Leugers**, Gold Standard + CLI