Factsheet

Sven Braden, CLI, June 2020

Blockchain for Climate Action – the Governance Challenge

Identifying best practices!

The development of use cases that combine climate action and blockchain technology or other innovative IT applications regularly face challenges when it comes the implementation of governance provisions. Governance determines who has power and who makes decisions. Governance is also about how others make their voice heard and who is accountable.

The current climate policy frameworks that monitor and manage climate relevant data between countries rely on central authorities. Under the UNFCCC, for instance, centralised institutions such as the CDM Executive Board or the International Transaction Log ensure that emission reductions are achieved and recorded accordingly. These institutions provide trust and risk mitigation. They are empowered with governing the operations of their respective systems. They are accountable and responsible. In decentralised and shared systems there is no central authority who is empowered with governing and operating the system and who is ultimately responsible.

Many problems with governance of blockchains to date underscore the need for robust governance for blockchain systems:

- the recent case of blockchain based social media platform steem.it, where a competitor colluded with crypto exchanges to influence the proof-of-stake decision making processes (2020),
- the Bitcoin's block size debate (2018), or
- the Ethereum hacking and the resulting community crisis (2016).

The rules and smart contracts to be embedded in a blockchain may have distributional, ethical and political consequences. Such rules may, for example, determine who gets paid for mitigation or adaptation action and who does not. Their enforcement creates winners and losers and gives rise to a set of operational and legal questions related to governance beyond the networks.

Table 1: Questions of Blockchain Governance

<table>
<tr><td colspan="3">Who is responsible and accountable for the system if something goes wrong?</td></tr>
<tr><td>Applicable law and jurisdiction?</td><td colspan="2">How is risk and liability apportioned?</td></tr>
<tr><td>Who is responsible for data security of the overall system?</td><td>How are changes to the software/protocol implemented?</td><td>How are errors dealt with?</td></tr>
<tr><td colspan="2">Who has the right to validate transactions?</td><td>How can new participants join?</td></tr>
<tr><td>How are disputes resolved?</td><td colspan="2">How will legal or regulatory change be dealt with?</td></tr>
<tr><td colspan="3">How are changes to the software/protocol implemented?</td></tr>
</table>

Source: Author.

Governance issues can occur in different forms and on various levels. They are not limited to the design of the chosen blockchain network. In the context of use case development under the Paris Agreement governance is a crosscutting issue, relevant on three levels:

(1) Governance on the international level
(2) Governance on the national level,
(3) Governance on the blockchain level.

Governance on the international level

If Blockchain technology is to accelerate the implementation of the Paris Agreement it needs to be ensured that relevant use cases (e.g. in carbon markets, MRV or climate finance) consider the rules as agreed in the international rulebook under the Paris Agreement. These rules frame the ecosystem of a crucial part of today's international climate policies and determine what climate related information countries must provide, in which format and how often. The rulebook determines how the

bookkeeping of national inventories, Nationally Determined Contributions and the international transfer of mitigation outcomes have to be carried out.

Although several governments and other relevant stakeholder asked for the inclusion of distributed ledger technology into the international rulebook the final texts that came out after Katowice at the COP24 in 2018 nor in Madrid's COP25 in 2019 did not contain such guidance (e.g. for management of registry data). However, the Article 6 rulebook is still under negotiation and the fact the rulebook does not mention specific technologies does not mean that they cannot be used to implement the Paris Agreement. Moreover, the Secretariat of UNFCCC has acknowledged the potential of blockchain for climate action. However, Blockchain technology tends to be developed bottom-up in a decentralised setting that does not require a centralised governance. Therefore, it is likely that it will be up to Governments to provide first use cases and lessons learned to the international climate community before a considerable UNFCCC instrument may run on distributed ledgers.

Governance on the national level

Further governance challenges may occur on the national level due to economic infrastructures of existing industries. In that context, national regulation and oversight of markets can facilitate or hinder the use of blockchain systems. For instance, in many countries, the national regulation of the energy sector assumes a system of large centralised power producers and is not well suited for decentralised power generation and peer-to-peer electricity markets of "prosumers".

Many legal issues, which are rooted in the national level, must still be addressed by traditional means. The determination of applicable law or ensuring legal compliance (e.g. through reflection of legal or regulatory changes) need to be dealt with by means of contract or equivalent arrangements. Moreover, in cases where disputes between network participants require a judgement based on a case-related analysis, the national legal system may consider such approach a rule-of-law violation, if, by default, judgments are delivered based only on the execution of software code.

Governance on the national level is also becoming increasingly relevant for the user of the blockchain based service. Users need to be aware about their rights and obligations caused by activities on a blockchain such as the initiation of transactions or adding ledger content. The possession of access keys to distributed and decentralized ledgers comes with a new level of self-responsibility. In many cases, be it contractual or because of legal provisions, the possessor of the access keys will automatically be considered as the rightful owner of the value which associated to the respective ledger. This legal presumption can become relevant for the determination of liability or negligence.

Moreover, the evolvement of legal frameworks regulating key aspects of blockchains such as data privacy, digital identification of participants (humans and machines) and "signatures", legal enforcement of smart contracts and the legality of crypto-currencies can help to engender trust among government entities and businesses.

Governance on the Blockchain Level

Finally, governance is relevant on the blockchain level itself. How are decisions made if the system does not rely on a central authority? Many aspects are of a technical nature and refer to operational processes. For example, the question who gets to validate transactions or how software and protocol changes are implemented relate to the operations of the network. These aspects can be incorporated into the rules and protocols of a Blockchain network. In fact, it is the determination of different operational governance features that gave raise to three different blockchain architectures: Public and

permissionless blockchains, federated or consortium blockchains and private or permissioned blockchains:

Table 2: Blockchain Governance Systems

Blockchain Type[1]	Description / Examples
Public ('permissionless') ledgers	A blockchain type where anyone can participate without needing permission or approval. Anyone can download code and start running a public node, validating transactions in the network, and contributing to the consensus process that determines what blocks get added to the chain and defining the current state. Most of the current consensus mechanisms in public blockchains contain the Proof of Work algorithm, which typically lead to high electricity consumption and are slower and more difficult to scale. Examples: Bitcoin, Ethereum, Litecoin
Federated or consortium blockchains	They operate under the leadership of a group and only allow specific nodes to participate in the verification process. The consensus process is controlled by a pre-selected set of nodes. They are faster, allow for higher scalability and provide more transaction privacy than public blockchains. Examples: Energy Web Foundation, R3/Corda
Private/permissioned blockchain	Permissions to write (and read) are kept centralised by one organisation. Example: Company internal blockchains for database management, e.g. Hyperledger

Source: CLI Navigating Report 2018

The rules and governance of blockchains themselves define who can access information, change protocol rules or data, mine tokens or coins, as well as setting required levels of transparency.

Conclusions

Blockchain technology and related innovative IT applications provides a key to solving some of the critical issues that hinder effective scaling of climate action under the Paris Agreement. Data records on a blockchain are immutable through a permanent ledger for increased transparency. The technology brings trust to peer-to-peer transactions which is particularly important in the context of weak regulatory settings or under decentralised governance.[2] However, the implementation of decentralisation while maintaining traditional governance is challenging.

With respect to governance requirements originating from international climate policy level development is still ongoing. Institutions operating on the level of international climate policies are aware of the potential of blockchain technology, but further experiences are necessary. IT and climate communities are currently working on the establishment of best-practice approaches.

On the national level new emerging legal frameworks regulating key aspects of blockchains may help to engender trust of blockchain technologies among government entities and the network users. A promising way to incentivise testing on the national level is to allow for experimentation. Therefore, some jurisdictions allowed for regulatory "sandboxes" that enable the experimentation with

[1] Fuessler in "Governance of Blockchain and Climate Action", p. 87, CLI Navigating Report 2018

[2] See "Key Findings for Policy Makers", p. 11, CLI Navigating Report 2018

blockchain approaches in different sectors within a supervised environment with trusted business partners.

On the blockchain level the technology creates trust between its users by operating along pre-defined rules written into the software code of a protocol. This may eliminate the need for trusted intermediaries. However, that does not work for governance provisions per se. Although technical and operational elements of governances can be embedded into a blockchain protocol, many legal questions remain to dealt with offline. To that regard it may be worth to consider the "comeback" of intermediaries for governance purposes.

Blockchain technology eliminates the middleman, which makes its bookkeeping services faster, cheaper, and more transparent. But when it comes to governance, a middleman may still be a viable option in order to ensure legal compliance with domestic laws. Such middleman can be appointed through contract, e.g. by the consortium of network participants.

Further experiences and lessons learned will help the evolvement of best practice approaches around blockchain and governance.

The Climate Ledger Initiative will work on a dedicated CLI knowledge product on Governance issues when using Blockchain and related digital innovations for climate action. The paper will highlight key issues that arise in real world use cases and discusses best practice governance solutions in different context. We are interested to share our experiences and insights with other use cases developers, researchers and policymakers and are looking for partners for collaboration on this important topic. Please let us know to which extend governance issues are important and what your experiences and strategies are.

Please contact Anik (anik.kohli@infras.ch).

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