USING BLOCKCHAIN TO ACHIEVE CLIMATE CHANGE POLICY OUTCOMES

BLOCKCHAIN'S BENEFITS FOR MARKET INTEGRITY, EFFICIENCY AND SCALABILITY SUPPORT BOTTOM-UP APPROACHES FOR THE IMPLEMENTATION OF NATIONALLY DETERMINED CONTRIBUTIONS AND THE PARIS AGREEMENT. TOM BAUMANN BREAKS IT DOWN

Transformational tools are needed to deal with the urgency and magnitude of the climate challenge. Blockchain enables higher levels of participation and ambition and can mobilise large scale investments into climate actions to achieve the goals of the Paris Agreement and the Sustainable Development Goals (SDGs). This article highlights blockchain initiatives and opportunities, as well as the challenges faced if the full potential of blockchain is to be achieved.

Many in the business community are already well advanced in their exploration of blockchain – beyond proof of concept projects and rapidly moving to fully commercialise blockchain within their businesses. IETA is well positioned to support its members and stakeholders with the evolution of blockchain for climate actions and carbon markets. Let's embrace blockchain and scale it, but let's do it right – cutting through the hype and implementing the systems to support innovators, policymakers and other stakeholders in a coordinated approach.

If you're new to blockchain –this article does not go into technical details to explain what blockchain is, so there are some links at the end to learn more. But, for the uninitiated, if you're new to blockchain then Bitcoin is a familiar example of distributed ledger technology (DLT) as a digital currency with cryptographic security (also referred to as cryptocurrency). Blockchain is an amazingly transformative technology with many applications beyond finance, including to supply chains, entertainment and health care. Dubai announced it would put the city on blockchain as part of its 2020 smart city strategy, reinforcing its actions to achieve its sustainability goals.

There are different blockchain designs; Bitcoin is one, and Ethereum is another. There are more protocols in development. Ethereum is very powerful because it enables users to define smart contracts within the blockchain. The smart contracts are self-executing processes that can perform a variety of tasks such as legal, accounting, assurance – and emissions measurement, reporting and verification (MRV) too.

What makes blockchain so compelling for many users are the multitude of benefits. The security, efficiency and transparency of blockchain applications build confidence directly into how it operates. For example, there is no double spending or double counting, and so costly intermediaries are not required – this saves time and money and counters fraud. Blockchain's technological advantages – it is open source and relatively lower cost than traditional business processes – enables innovative businesses to emerge rapidly and more directly engages and empowers stakeholders. This is evident in the multitude of blockchain start-ups and the ability to mobilise non-traditional finance like crowdsourcing via initial coin offerings (ICO) and token sales. As of November, blockchain funding will have raised over $2 billion so far this year – disrupting the global venture capital industry.

Blockchain in combination with smart meters and devices (ie, "the Internet of Things", or IoT) and big data analytics can convert mountains of unused data into valuable assets, such as energy use and emissions profiles. Blockchains using smart contracts can enhance transparency and integrate robust governance and accountability across an array of standards and programmes needed by government authorities and the investment community.

support compatibility among the growing array of scalable blockchain applications (eg, to support roll-ups for Nationally Determined Contributions and carbon markets), an innovative, next generation collaborative governance system would support scalable coordinated, distributed rule-making. Such a Nextgen system, which I am co-leading with IETA from October 2017, will enable the efficient and coordinated development of MRV standards and rules to structure and operate blockchain applications.

Blockchain initiatives for climate and sustainability have been gradually emerging over the last three years. In my role at the Blockchain Research Institute, I am monitoring developments and now I am seeing one to two new initiatives per week. Indeed there is a major acceleration in new initiatives, and many are proceeding directly to an ICO or token sale to quickly raise capital and fund their development. I have tracked over 30 blockchain

MANY IN THE BUSINESS COMMUNITY ARE ALREADY WELL ADVANCED IN THEIR EXPLORATION OF BLOCKCHAIN

TABLE 1

CARBON COIN	WWW.CARBONCOIN.CC
CARBONX	WWW.CARBONX.CA
CENTRE FOR CITIZEN ENTERPRISE AND GOVERNANCE	WWW.CCEG.ORG.UK AND WWW.SERATIO-COINS.WORLD
CLIMATE LEDGER INITIATIVE	WWW.CLIMATELEDGER.ORG AND WWW.HACK4CLIMATE.ORG
CLIMATE CHAIN	WWW.THECLIMATECHAIN.ORG
EARTH TOKEN	WWW.EARTH-TOKEN.COM
ENERGY BLOCKCHAIN LABS	WWW.ENERGY-BLOCKCHAIN.COM
ENERGY WEB FOUNDATION	WWW.ENERGYWEB.ORG
FINTECH4GOOD	WWW.FINTECH4GOOD.CO
GRID+	WWW.GRIDPLUS.IO
DAO INTEGRAL PLATFORM FOR CLIMATE INITIATIVES	WWW.IPCI.IO
POSEIDON	WWW.POSEIDON.ECO
POWER LEDGER	WWW.POWERLEDGER.IO
SOLAR COIN	WWW.SOLARCOIN.ORG
VERIDIUM	WWW.VERIDIUM.IO
VOLT MARKETS	WWW.VOLTMARKETS.COM
XPANSIV	WWW.XPANSIVDATA.COM

initiatives across climate and sustainability (as of October 2017), which include specific technology applications, large multi-stakeholder multi-issue initiatives and finance. Examples are in Table 1.

Although the growth of blockchain applications across climate and sustainability is vast – including for carbon trading, supply chains, climate finance and clean energy – it's widely acknowledged that the technology is still at an early phase. Similar to the early days of the Internet, many are rightfully concerned about the potential risks of blockchain – eg, will it disrupt my business or will I lose my job. As with other transformations, stakeholders should become informed and engaged to seize the opportunities – and there's no doubt there are massive opportunities!

Like other emerging technologies, blockchain faces challenges. Some of the technical concerns include:

- high energy consumption for financial applications like bitcoin, which involve intensive algorithmic computations to confirm transactions;
- data transfer into/out of blockchain applications, eg, IoT, need to address speed and security;
- relatively few blockchain developers are available (as of July 2017, the estimate is only 1,000-2,000); and,

- diversity of types of blockchain technologies could create incompatibility, which requires the industry stakeholders to establish the blockchain governance and standards to avoid the technology lock-in risk.

Examples of non-technical challenges include:

- stakeholders' lack of understanding of the technology and its applications, eg, privacy on transactions, access to commercially-sensitive data, security of the digital assets, access to digital technologies (such as smart devices), and the costs/benefits of using blockchain as an alternate to conventional financial services;
- uncertainty about government involvement and how business will/ can adapt; and,
- the lack of, and the overarching need for, a governance system to support blockchain applications.

Blockchain technology has the potential to establish efficient peer-to-peer transactions without the need to have an intermediary such as a bank. However, a new governance system will be needed to ensure market and environmental integrity in a peer-to-peer environment. Realising the speed, agility and scalability that blockchain offers will require new types

of collaborative distributed governance systems that incentivise and motivate participants. Otherwise, the deployment of the digital technologies and climate actions necessary to achieve the goals of the Paris Agreement and the SDGs will be inhibited by bottlenecks associated with the application of technical governance (standards, protocols, methodologies) mechanisms in a digital context.

Tom Baumann is co-founder of ClimateCHECK and Collaborase. ClimateCHECK is partnered with IETA for Nextgen governance systems to support blockchain applications for climate and sustainability. He is also a co-founder of Xpansiv (a company using blockchain in commodity markets), as well as Faculty at Blockchain Research Institute, and Advisor, CarbonX (blockchain for customer loyalty programmes). Tom is also co-founder of the Greenhouse Gas Management Institute and International Chair of ISO's Climate Change Standards Committee.

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