Centre for International
Governance Innovation

Conference Report – Toronto, Canada, June 2017

Blockchain ClimateCup Round Table

Timiebi Aganaba-Jeanty, Sam Anissimov and Oonagh E. Fitzgerald

Centre for International
Governance Innovation

Conference Report – Toronto, Canada, June 2017

Blockchain ClimateCup Round Table

Timiebi Aganaba-Jeanty, Sam Anissimov and
Oonagh E. Fitzgerald

CIGI Masthead

Executive

President Rohinton P. Medhora

Director of Finance Shelley Boettger

Director of the International Law Research Program Oonagh Fitzgerald

Director of the Global Security & Politics Program Fen Osler Hampson

Director of Human Resources Susan Hirst

Interim Director of the Global Economy Program Paul Jenkins

Chief Operating Officer and General Counsel Aaron Shull

Director of Communications and Digital Media Spencer Tripp

Publications

Publisher Carol Bonnett

Senior Publications Editor Jennifer Goyder

Publications Editor Susan Bubak

Publications Editor Patricia Holmes

Publications Editor Nicole Langlois

Publications Editor Lynn Schellenberg

Graphic Designer Melodie Wakefield

For publications enquiries, please contact publications@cigionline.org.

Communications

For media enquiries, please contact communications@cigionline.org.

Printed in Canada on paper containing 10% post-consumer fibre and certified by the Forest Stewardship Council® and the Sustainable Forestry Initiative.

Centre for International Governance Innovation

67 Erb Street West
Waterloo, ON, Canada N2L 6C2
www.cigionline.org

Table of Contents

About the Authors

Timiebi Aganaba-Jeanty is a post-doctoral fellow with CIGI's International Law Research Program (ILRP). While at CIGI, her research examines the governance structures addressing global commons environmental issues, with a special emphasis on technology.

Sam Anissimov is junior counsel at CIGI, providing assistance to CIGI's chief of staff and general counsel on a range of legal matters. He also provides support for the ILRP's research programs through the provision of independent research, research assistance, event planning and execution.

Oonagh E. Fitzgerald is director of the ILRP at CIGI, overseeing the development of its international economic, environmental, intellectual property and Indigenous law research streams. She has extensive experience as a senior executive of various departments of the federal government, including as a senior federal public servant with the Privy Council Office and Departments of Justice, Human Resources Development and National Defence.

About the International Law Research Program

The International Law Research Program (ILRP) at CIGI is an integrated multidisciplinary research program that provides leading academics, government and private sector legal experts, as well as students from Canada and abroad, with the opportunity to contribute to advancements in international law.

The ILRP strives to be the world's leading international law research program, with recognized impact on how international law is brought to bear on significant global issues. The program's mission is to connect knowledge, policy and practice to build the international law framework — the globalized rule of law — to support international governance of the future. Its founding belief is that better international governance, including a strengthened international law framework, can improve the lives of people everywhere, increase prosperity, ensure global sustainability, address inequality, safeguard human rights and promote a more secure world.

The ILRP focuses on the areas of international law that are most important to global innovation, prosperity and sustainability: international economic law, international intellectual property law and international environmental law. In its research, the ILRP is attentive to the emerging interactions among international and transnational law, Indigenous law and constitutional law.

Executive Summary

Interest has been ignited in blockchain technology's potential contribution to solving some of the complex coordination challenges involved in addressing the urgent problem of climate change. For example, measuring and managing greenhouse gas emissions, mobilizing financial resources for mitigation and adaptation efforts, and improving transparency around climate action are key priorities of the Paris Agreement on climate change, and each requires the coordinated action of several arms-length participants — a seemingly opportune fit for distributed ledger technology.

Implementation of the Paris Agreement may benefit from development of multidisciplinary expertise and institutional collaboration at the intersection of blockchain technology and climate action. As part of its work on connecting international law and technology to overcome challenges in global governance, CIGI's Blockchain ClimateCup Round Table brought several leading blockchain innovators together with experts in climate change policy, law and governance. Participants educated one another about the Paris Agreement implementation challenges and cutting-edge applications of blockchain technology for various aspects of climate action. The event concluded with participants brainstorming on how three key climate blockchain use cases — finance, transparency and distributed energy — may come to fruition in the near future.

Introduction

On June 24, 2017, the International Law Research Program (ILRP) at the Centre for International Governance Innovation (CIGI) held a round table discussion dedicated to considering how distributed ledger technologies could be applied to facilitate meeting the reporting, accountability and transparency requirements of the Paris Agreement on climate change.[1] The event, conducted under the CIGI Discussion Rule,[2] brought together 37 participants, 15 of whom made presentations in one of three showcase and discussion sessions. The following stakeholder groups were represented: think tanks and educational institutions, foreign and Canadian public-sector organizations, and private-sector institutions, including start-up and not-for-profit companies.

Legal, Political and Implementation Challenges for the Paris Agreement

How Can Blockchain Help?

Enjoying nearly universal acceptance, the 1992 United Nations Framework Convention on Climate Change (UNFCCC)[3] established a global commitment to prevent harmful interference with the climate system by anthropogenic greenhouse gas emissions. The 2015 Paris Agreement, which came into force in 2016, sets the common goal of limiting the average global temperature increase to below 2°C and as close as possible to 1.5°C above pre-industrial levels.

If one considers the structure of the Paris Agreement, one readily sees that there are various ways in which enhanced ledger keeping could be supportive of the agreement's implementation. After setting out the overall goal of controlling global average temperature increases, article 4 requires each state party to "prepare, communicate and maintain successive nationally determined contributions (NDCs) that it intends to achieve." Article 6 envisions that state parties may cooperate voluntarily in using internationally transferred mitigation outcomes to contribute to NDCs. Article

1 United Nations Framework Convention on Climate Change, *Paris Agreement*, 12 December 2015 (entered into force 4 November 2016), online: <http://unfccc.int/files/essential_background/convention/application/pdf/english_paris_agreement.pdf>.

2 When discussions are held under the CIGI Discussion Rule, participants are free to use the information received, but no participant's individual or institutional views about that information shall be revealed; this rule shall not prevent the consensus of the participants, as a group, or the identity and affiliation of group members from being revealed.

3 United Nations Framework Convention on Climate Change, FCCC/INFORMAL/84 (entered into force 21 March 1994), online: <https://unfccc.int/resource/docs/convkp/conveng.pdf>.

9 provides that developed country parties shall take the lead in providing and mobilizing "financial resources to assist developing country Parties with respect to" climate mitigation and adaptation. Article 10 exhorts parties to "cooperative action on technology development and transfer." Article 12 requires parties to "cooperate in taking measures… to enhance climate change education, training, public awareness, public participation and public access to information" in order to put pressure on governments to enhance their climate action. Article 13 establishes "an enhanced transparency framework for action and support, with built-in flexibility which takes into account Parties' different capacities," with a view to building "mutual trust and confidence and to promote effective implementation," and requires that developing countries receive support in "building of transparency-related capacity." Article 14 provides for a "global stocktake" in which the Conference of the Parties shall periodically take stock and "assess the collective progress towards achieving the purpose of" the Paris Agreement and "its long-term goals." Article 15 establishes a compliance mechanism "to facilitate implementation of and promote compliance with" the agreement.

This summary overview of the Paris Agreement demonstrates that it is not particularly prescriptive but rather relies heavily on nationally determined climate action commitments, self-reporting by states parties, peer and expert review of progress, and facilitating bottom-up climate action by non-state actors and civil society. The agreement requires large amounts of climate-related data to be collected, stored, analyzed and compared. There will need to be a common but flexible standard for reporting that allows both developed and developing countries to input their data. Developing a reliable, global ledger of such critical data may assist in the global stocktaking and help to encourage increased ambition by states parties.

Distributed ledger technology, or blockchain, allows for the secure and automated reconciliation of digital accounts by cryptographically ensuring consensus among all participants of a given ledger. Although blockchain had its start nearly a decade ago in the digital currency space, it is now being deployed or considered for deployment in a diverse array of private, not-for-profit and public-sector applications. For example, one round table participant surveyed several branches of the United Nations (the United Nations Office for Project Services, United Nations Development Programme, United Nations Children's Fund, UN Women, United Nations High Commissioner for Refugees, World Food Programme and International Telecommunication Union), all of which are either using or investigating the application of blockchains in their areas of expertise. In the context of the Paris Agreement, automated and distributed ledger reconciliation offered by blockchain technology can have a number of impactful applications, including:

- → providing a reliable record of worldwide emissions data as an input into discussions regarding NDCs in the context of the global stocktake;
- → assisting in the mobilization of climate finance and informing climate financing decisions through the incorporation of available climate change and other data into new financial products or ventures traded or implemented on a blockchain; and
- → enhancing the level of transparency around each country's mitigation efforts, while improving its infrastructural capacity, especially in the case of countries lacking the necessary institutions and processes for complying with the transparency framework.

Aside from the specific provisions of the Paris Agreement summarized above, leveraging blockchain technology is also crucial to achieving the agreement's emissions goals. The numerous and diverse applications of blockchain technology — whether in creating distributed energy production systems or new green finance vehicles — enable governments, business and civil society to engage in coordinated, yet disintermediated, action in achieving scientifically established emissions reduction targets. However, in order to unleash innovation and new opportunities across different sectors, these parties must collaborate to build capacity and understanding around climate objectives, standards and governance.

State of the Technology

Spotlight on Climate Change Blockchain Use

An important component of the round table was to see demonstrations by innovators involved in applying blockchain technology to address the Paris Agreement goals of reducing greenhouse gas emissions, financing climate change mitigation and adaption, and national and global progress on climate action. The following initiatives were presented and discussed by their proponents.

DAO IPCI

The Decentralized Autonomous Organization Integral Platform for Climate Initiatives (DAO IPCI) is a decentralized and fully independent public blockchain ecosystem based on smart contracts for the trade of any kind of environmental assets and liabilities. The project seeks to minimize transaction costs by providing a reliable, transparent blockchain and a smart contracts-based alternative to traditional registries, trading platforms, exchanges and brokerage services. In March 2017, the organization completed its first international carbon credit transaction on the blockchain.

Energy Blockchain Labs

Based in China, this organization seeks to develop a range of enterprise-class blockchain applications, including green certification and financial services, for the energy and environmental protection industry. By working with market players to standardize green asset-backed securities, its solutions will allow enterprises to generate carbon assets more efficiently, helping to build a green, low-carbon and environmentally friendly future in China.

WeiFund

Belonging to the Consensys-distributed application ecosystem, WeiFund is an open crowdfunding platform implemented through smart contracts on the Ethereum blockchain. As part of its offering, the platform seeks to minimize the cost of matchmaking inherent to crowdfunding initiatives by putting forward a secure, standardized and modular tool for executing all varieties of crowdfunding transactions in a user-friendly fashion. Possible applications of the platform include crowdfunding campaigns to mobilize finance for green initiatives.

SolarCoin Foundation

SolarCoin is a blockchain-based digital asset created as a means to incentivize global solar electricity generation. By participating as a verified solar energy producer or node on the SolarCoin network, a worldwide group of computer participants who process SolarCoin transactions, network members receive SolarCoin, which they can then redeem through participating affiliates or exchange for other currencies through a number of online exchanges.

Digital Currency Initiative

The Digital Currency Initiative is a group at the Massachusetts Institute of Technology's Media Lab, focussing on cryptocurrency and its underlying technologies. Among other things, the initiative explores using digital currency and distributed-ledger technology to securitize transactions among users and owners of blockchain-managed solar microgrids. Its goal is to help create a secure form of reliable, executable collateral to lower risks for lenders and reduce the cost of financing decentralized, renewable energy infrastructure, especially in developing countries.

LO3 Energy

LO3 Energy is an energy technology company that helps utility and energy retail customers' clients create, deploy and monetize differentiated energy products and customer services in increasingly open and competitive electricity markets. The company has developed a proprietary blockchain platform, which it utilizes as part of its key offerings, including the TransActive Grid, a platform that enables peer-to-peer energy transactions. LO3 Energy is also engaged in a proposal to develop a community microgrid in Brooklyn, New York, that would enable its members to function separately from the larger electrical grid during extreme weather events or other emergencies.

IOTA

Proposed to be led by a non-profit organization registered and headquartered in Berlin, Germany, IOTA seeks to adapt blockchain technology to serve as a backbone for the internet of things (IoT). By utilizing a unique distributed ledger architecture for managing and processing transactions, the

company expects its platform to be able to scale to adequately service the IoT economy, while maintaining low resource requirements and minimal transaction fees. To the extent that climate change action will require an extensive amount of accurate data from sensors and other IoT-compatible devices, this platform can serve as a foundational software solution for mobilizing informed action.

Xpansiv

Xpansiv helps commodity producers unlock the value hidden in their operational data through enhanced visualization and analytics, business process optimization, product differentiation and access to new markets. By combining big data with distributed ledger technology, Xpansiv's platform transforms operational data into a real-time digital representation of each unit of commodity produced. This allows producers to not only develop insights into the full attributional profile of a commodity, but also to create new products and mechanisms that differentiate between previously untracked commodity characteristics.

Collaborase

Collaborase is the developer of affordable blockchain-reliant tools that address many of the problems holding back consensus-based mass collaboration. As one of its goals, the organization seeks to inspire a cultural change in how stakeholder engagement is conducted. Considering the standardization challenges facing climate change governance stakeholders, Collaborase tools hold the promise of efficiently increasing the engagement and confidence of participants in standards-setting discussions by enabling the creation of secure and shareable living documents that result in smart standards for the rest of the world.

Hiveonline

Hiveonline is a scalable financial trust platform for small businesses. The platform combines business rules, analytics and artificial intelligence on top of a blockchain to allow small businesses to easily manage cash flow, administrative and other similar types of information while interfacing with customers, banks, partners and regulatory authorities. As a potential offering, the company hopes to provide a software solution useful to businesses and their stakeholders in conducting fact-based evaluations, for example, in the area of sustainable development.

Breakout Sessions

After discussion of the use case demonstrations, participants were divided into three breakout sessions focused on specific climate change issues that blockchain technology has the potential to transform: climate finance, environmental data transparency and distributed energy production. The following summarizes the outcomes of each session.

Blockchain and Climate Finance

Whether and how blockchain technology will transform climate finance depends to some extent on how climate finance is defined. The participants of this breakout group distinguished between the impact of climate on finance, such as the climate-driven disruption of supply chains or investment behaviour, and the role of climate finance in reducing greenhouse gas emissions. The latter can be further subdivided into public finance, which subsumes the Paris Agreement parties' commitment to mobilize US$100 billion annually by 2020,[4] and private finance, likely valued in the trillions of dollars. These categories of finance are, in turn, also quite multifaceted, with components ripe for blockchain disruption — crowdsourcing, asset trading and investment management being just a few areas in which blockchain technology can be transformative. Given the massive scope of the subject, group participants prefaced the following observations on the technical and non-technical challenges as being far from exhaustive.

Technological Obstacles to Blockchain Potential

→ **Getting the right data:** Given that investment decisions are essentially assessments of potential rewards versus associated risks, having enough of the right kinds of data should be of chief concern to stakeholders in climate finance. As blockchain applications are fundamentally mechanisms to record, store and act upon data, climate change mitigation and adaptation actors must be diligent in applying the technology to focus on the critical relevant data.

4 This commitment concerns only the parties to the agreement that have developed economies.

- **Blockchain interoperability:** While an abundance and diversity of players at the intersection of climate change and blockchain technology may be indicative of a healthy ecosystem, serious inefficiencies can result if the activities of each application are confined to silos. To ensure growth and cost-effectiveness in the long term, ecosystem stakeholders should work toward greater interoperability among various blockchain solutions and, consequently, consider the adoption of standards around relevant touchpoints and metrics.

- **User friendliness:** Investors interested in blockchain-based approaches to climate finance face significant barriers to participation. Aside from reformulating conventional financial relationships, blockchain-driven investment applications also require a certain degree of technological savvy of their users, who must be willing to overcome both a conceptual learning curve and a user interface that often leaves much to be desired.

Non-technological Obstacles to Blockchain Adoption

- **Lacklustre financial innovation:** Places where climate action could have a significant preventive impact also happen to be those where traditional financial models are unworkable. For example, people in locations not yet on an electrical grid could have the potential to leapfrog to a distributed transactive smart grid, if not for their concurrent inability to bank or secure loans for the necessary equipment, such as solar cells. Group participants posited that a willingness to try new and innovative financial solutions, such as the collateralization of necessary equipment through blockchain means, is necessary to overcome such obstacles.

- **Cultural barriers:** Societies in which people are conditioned to technological change, dependable infrastructure, legal fail-safes and abundant alternatives may approach innovations more open-mindedly than those in which that shared experience differs. Breakout group participants considered whether cultural dimensions might pose obstacles to the adoption of blockchain technology for financial purposes, for example, in developing countries where traditional transaction platforms may be unreliable.

- **Regulatory uncertainty:** Actors in the field of finance tend to be heavily regulated, which means that serious monetary flows directed toward climate change objectives through blockchain mechanisms are likely to attract the interest of regulators in areas such as securities, consumer protection and money laundering. Before investors and investees can truly embrace blockchain solutions to mobilize climate finance, work needs to be done to educate regulators across the world to safeguard innovative initiatives from uninformed regulatory caution.

Steps to Resolving Obstacles in this Area

Participants of this breakout session considered that there would be little chance of making progress in deploying blockchain-enabled green finance without engaging the banking and regulatory authorities that dominate global finance. The participants therefore recommended that, aside from working together to solve standards and interoperability issues, the blockchain community should engage early on with established players, such as banks and regulators, to build trust and acceptance around disruptive ideas, perhaps starting with those that are least disruptive. This strategy could allow the community to foster the rollout of illustrative proofs-of-concept with the help of traditional finance, thereby de-risking them in regulators' eyes, while drawing on the incumbents' expertise in serving everyday customers and investors.

Blockchain and Environmental Data Transparency

The participants of this breakout session focused on blockchain technology as primarily a means of data management and communication that is fast, resilient and transparent. As the technology eliminates the need for a trusted party to facilitate digital relationships or curate data, it also vastly expands the range of automatable operations about which it is possible to have reliable information. This opens the door to unprecedented insights into inputs and outputs of production processes.

For climate change efforts, blockchain-driven digitization entails the ability, for example, to verify the environmental credentials of energy commodities, track greenhouse gas emissions, or facilitate the trading of tokenized assets such as carbon credits. Especially when augmented through applications such as smart contracts,

the participants viewed blockchain technology as having great potential to transform how governments and individuals, in developing countries in particular, collect and act upon data. However, as digitization is also defined by equally pressing legal and security issues, the participants identified a large number of associated obstacles that could frustrate blockchain technology in fulfilling its promise.

Technological Obstacles to Blockchain Potential

- **The need for oracles:** Smart contracts, which are distributed applications built on top of a blockchain, often depend on a third-party data feed, called an oracle, to signify milestones or trigger transactions if the operation of the application depends on some external event. If blockchain technology is to empower action in the climate change arena, it is vital for governments to support the creation or deployment of oracles trafficking in relevant climate data, which can be used by developers to build blockchain applications that are both compatible with, and a have a direct bearing on, offline events.

- **Best practices:** In the context of software development, qualified developers rely on design patterns to guide their development of complex projects. The participants felt that distributed applications, such as smart contracts on a blockchain, could benefit from the same practice. However, in the case of smart contracts, there may be a need for design patterns to parallel legal best practices in contract drafting and other related fields during the course of their design, if those applications are to carry out the functions of their analog counterparts.

- **Data security:** Where vast amounts of potentially sensitive data are stored together, security is usually an underlying expectation. Today, blockchains meet that expectation through encryption. However, simultaneous breakthroughs in areas such as quantum computing may be putting the strength of traditional encryption into question. Participants therefore asked whether, in the long term, blockchain applications can ensure sufficient levels of security for data they store.

Non-technological Obstacles to Blockchain Adoption

- **Data localization:** The participants identified a growing number of jurisdictions that have enacted data localization laws designed to keep their citizens' personal data in-country and subject to local regulation. While this trend is understandable, it is inherently incompatible with a true blockchain implementation, exemplified by initiatives such as the InterPlanetary File System protocol, which is highly distributed by design and thus lacks national character.

- **Legal frameworks:** As more transactive activity takes places on blockchains, it is reasonable to expect that unintended or unforeseen consequences of relying on disintermediated or automated contracting will increasingly materialize in the form of legal disputes around issues such as contract validity, enforceability, jurisdiction and intermediary liability. Participants posited that uncertainty around how such disputes would be handled by existing legal systems may damage the long-term value of applications such as smart contracts, unless legislative authorities act to dissipate them.

Steps to Resolving Obstacles in this Area

As blockchain technology transitions into mainstream applications, user expectations will require development teams to command multidisciplinary expertise to provide experiences that are both predictable and secure, whether those experiences are legal, financial or transactional in nature. In cases where blockchain operations simply replicate an existing function, it makes sense to replicate the best practices that already exist in that field. In practice, the participants agreed this would require greater collaboration between software development professionals and other experts in such areas as business, law and governance.

On the governance front, participants envisioned collaboration taking a variety of forms. On the one hand, conversation between key regulators and the innovation community is crucial. Rule makers must remain receptive to unconventional thinking and create visible touchpoints through which innovators can engage with them. On the other hand, considering the international character of blockchain technology, analogous governance institutions in different jurisdictions would do

well to engage one another to create multilateral frameworks that enable innovative companies to operate predictably worldwide. As an example of both ideas in action, the participants highlighted the work of the Ontario Securities Commission (OSC), which in 2016 introduced its LaunchPad initiative to work with fintech companies in both navigating and evolving securities regulations. More recently, the commission signed a cooperation agreement with the UK's Financial Conduct Authority, pursuant to which these regulators may refer businesses to one another with the objectives of reducing regulatory uncertainty and time to market in each jurisdiction.

The work of the OSC illustrates that governance institutions are not merely mediators, but have a leadership role to play in the deployment of new technologies. The participants reflected on whether a lack of international standards with respect to key climate change metrics is impeding the development of software solutions around those types of data. To that end, session participants agreed that the international community can break down barriers to innovation in the climate change arena through convergence of standards around key metrics on which community members, such as the parties to the Paris Agreement, intend to deliver.

Blockchain and Distributed Energy Production

In practical terms, discussions about humanity's contribution to climate change are discussions about the production and consumption of energy. The link is embodied in electrical grids, which have traditionally been used to distribute electricity from places of large-scale power generation to consumers. However, the expectations of consumers and governments are creating an operating environment in which the paradigm of centralized energy production and distribution is increasingly challenged.

For example, many of today's energy consumers are also energy producers, or "prosumers," who want to be able to buy and sell locally sourced renewable energy. The Paris Agreement expresses a near-global commitment to reducing greenhouse gas emissions. Many nations have, in fact, taken steps to diversify their energy mix in favour of renewables in recent years. The power systems of tomorrow will be expected to accommodate energy sources of intermittent reliability, exhibit adaptive resiliency and help coordinate a greater number of participants in the energy marketplace.

The participants of this breakout group identified blockchain technology as an important element of a distributed energy future, but found challenges in this space to be less related to the technology or its governance than to the business and regulatory environments that keep the energy space from evolving toward decentralization.

Technological Obstacles to Blockchain Potential

- **Scalability of distributed transaction platforms:** The great number of transactions one would anticipate on a power grid enabling peer-to-peer exchange necessitates cost-efficient and speedy transactions. Participants considered that, in the long term, current scalability issues are likely to be overcome, given existing development road maps and parallel workaround initiatives such as sidechains.

- **Tokenization of physical assets:** Although tokenization is a concept that is growing in popularity in the marketplace of ideas for blockchain applications, the representation of real things as digital tokens is not without its complexities. Some participants posited that it is not always obvious how on-the-chain transfers could stay reliably linked to discrete movements of electricity between specific peers — the physical world does not behave as predictably as its digital counterpart.

- **Permissioned environments:** Today's blockchain technology ecosystem exhibits considerable diversity in the underlying philosophical underpinnings of different platforms. Enterprise-oriented blockchain solutions now serve as viable alternatives to fully permissionless and truly decentralized platforms. Therefore, the values of organizations ultimately trusted to deploy the blockchain technology necessary to operate a distributed energy production system can have a significant impact on the degree to which that technology disrupts the status quo. There are questions about how to ensure the trustworthiness of solutions being deployed.

Non-technological Obstacles to Blockchain Adoption

As the costs of fossil fuels increase due to taxation of emissions and growing costs of extraction, power generation and distribution systems predicated on those fuels being cheap will find themselves under more pressure. However, the

business models of incumbents in control of those systems are heavily rooted in centralized modes of supply, which are often entrenched through vertical integration or government regulation. Because blockchain technology merely facilitates secure and efficient peer-to-peer transactions in a decentralized energy supply system, the primary obstacle to its adoption in a given market is the degree to which new energy producers are able to enter it to compete. Participants of this breakout session therefore reflected on the following points.

- **Jurisdictions differ:** Whether the relevant decision makers in a particular jurisdiction are willing to foster the development of a transactive energy system depends on a number of factors, including the number of decision makers, the number of incumbents and the degree of industrialization. Intuition would suggest that a relatively industrialized jurisdiction in which decision-making power is concentrated, but in which competition is healthy, would have the strongest chance of summoning the political will necessary to modernize its energy grid.

- **Adopting a more transactive approach:** The cost of, demand for and the difficulty in supplying electricity are not static. Yet flat pricing, which decouples the price a consumer pays for electricity from the cost of its production at the time of consumption, remains the most widely used pricing model. Unlike a transactive grid, a power grid in which the price is fixed can render intermittent and non-industrial energy generation unprofitable. The adoption of transactive grid principles, which would allow the grid to more closely match energy supply and demand, is therefore in some ways a prerequisite for the proliferation of distributed energy production. If blockchain technology is to assume its role in the energy transaction space, jurisdictions must first embrace market-based approaches to electricity pricing. At the same time, this would require regulatory oversight to avoid supply and price manipulation.

- **Market access:** Because electricity transmission and distribution involve capital-intensive infrastructure, but are most efficiently performed by a single local entity, utility companies are often properly construed as natural monopolies, which entails heavy government regulation. In order to engage in a peer-to-peer energy transaction system through the power grid, actors must be able to overcome several regulatory and market barriers, such as those related to licensing, interconnection standards, net metering, dispatching, stranded costs and standby charges.

Steps to Resolving Obstacles in this Area

The participants focused on implementation of the Paris Agreement as the primary instrument driving climate change action and considered it to be a key avenue for advancing the development of distributed energy production systems. More specifically, the commitment of the parties to finalize, by 2018, the rule book operationalizing the agreement offers a milestone for accelerating the discussion on power generation and distribution methods. Questions about the financing of developing countries' climate change adaptation measures were still outstanding as of COP22. Participants wondered whether some portion of the funds to be mobilized could be directed toward the betterment of electrical grids in developing countries and toward initiatives that would improve the adaptability of the electric power industry.

Next Steps and Outcomes

The blockchain and climate change innovation demonstrations and discussions, followed by the focused consideration of applying blockchain technology to climate finance, environmental data transparency and distributed energy production, provided many insights into the potential for positive convergence of this technology with the requirements of the Paris Agreement. Participants were invigorated by the rapid pace of innovation in relation to climate change governance and blockchain technology. Having identified both challenges and opportunities related to blockchain adoption in support of climate action, participants committed to continue to work in distributed global and local networks to influence international and domestic policy makers, industry leaders and civil society to further the implementation of the Paris Agreement through application of blockchain technology. There was interest in collaborating in the staging of climate change and blockchain hackathons, as well as generating further policy, business and technical discussions about the potential of adoption, commercialization and scale-up of blockchain-enabled climate change solutions.

Agenda

June 23–24, 2017
Four Seasons Hotel, 60 Yorkville Avenue, Toronto, ON

June 23

6:30–9:00 p.m. Informal Welcome Dinner and Networking, Four Seasons Hotel, Westwind Room

June 24

8:30–9:00 a.m. Registration and Breakfast

9:00–9:15 a.m. Welcome and Introductions — Oonagh E. Fitzgerald and Julie Maupin

9:15–11:00 a.m. State of the Technology: Blockchain/DLT for Green Finance

- → Anton Galenovich, Alexey Shadrin and Sergey Lonshakov, Russian Carbon Fund: "DAO IPCI Impact Mitigation: Practical Concepts, Lessons Learned and Prospects"
- → Cao Yin, Energy Blockchain Labs: "Utilizing Blockchain Technology to Create Carbon Credit in China"
- → Henry Chan, ConsenSys: "WeiFund: Crowdfunding on Ethereum"
- → Tejas Sawant, SolarCoin Foundation: "SolarCoin Powering the Energy Transition"
- → Michael Casey, MIT Digital Currency Initiative: "Using the Blockchain to Affordably Finance Solar Energy in Off-grid Communities"

Moderator: Julie Maupin, Max Planck Institute

11:00–11:15 a.m. Health Break

11:15 a.m.–13:00 p.m. Discussion: Legal, Political and Implementation Challenges of the Paris Agreement on Climate Change: Can Blockchain Help?

- → Alexandre Gellert, UNFCCC secretariat: "The Potential of Blockchain Technology to Enhance Climate Action"
- → Marcela Scarpellini, right. based on science: "Science Based Targets: the right. starting point"
- → Nick Beglinger, CleanTech21: "Blockchain for Climate"
- → Maria Netto, Inter-American Development Bank: "Blockchain as a Tool to Promote Access to Finance"
- → Claire Henly, Rocky Mountain Institute/Energy Web Foundation: "Energy Web Foundation: The Open Source, Blockchain-based Platform for the Energy Sector"

Moderator: Andrei Marcu, International Centre for Trade and Sustainable Development

1:00–2:00 p.m.	Lunch
2:00–3:45 p.m.	State of the Technology: Using Blockchain/DLT to Aid the Transition to Green/Low-carbon Business and Energy Infrastructures

- → Lawrence Orsini, LO3 Energy: "Distributed Grid Solutions that Bring People, Technology and Energy Together"
- → Dominik Schiener, IOTA: "Building a Green Machine Economy: from Vision to Practice"
- → Sofie Blakstad, Stockholm Green Digital Finance: "Trust and Transparency for a Sustainable Future"
- → Jason Libersky, Xpansiv: "Leveraging Existing Commodity Production Data to Deliver Sustainability Objectives"
- → Tom Baumann, Collaborase: "Standards 2.0 Governance Innovation for Blockchain"

Moderator: Thomas Chrometzka, GIZ

3:45–4:00 p.m.	Health Break
4:00–5:00 p.m.	Breakout Sessions: Mapping the Gaps between Technology, Law, Policy and Implementation
5:00–5:30 p.m.	Reports from Breakout Sessions
5:30–5:45 p.m.	Wrap-up and Discussion of Next Steps: Oonagh E. Fitzgerald and Julie Maupin
5:45–7:00 p.m.	Reception

Participants

Timiebi Aganaba-Jeanty
Post-doctoral fellow, CIGI ILRP

Sam Anissimov
Junior counsel, CIGI

Tom Baumann
Co-founder, interactive leader, Collaborase and Xpansiv

Nick Beglinger
Co-founder and chief executive officer, Cleantech21 Foundation

Sofie Blakstad
CEO, Hiveonline

Michael Casey
Senior advisor, Digital Currency Initiative at MIT's Media Lab

Henry Chan
ConsenSys

Ling Chen
Research Associate, CIGI ILRP

Thomas Chrometzka
Director, renewable energy, Gesellschaft für internationale Zusammenarbeit (GIZ)

Stanislas Dupre
Director, 2° Investing Initative

Oonagh E. Fitzgerald
Director, CIGI ILRP

Anton Galenovich
Russian Carbon Fund

Alexandre Gellert Paris
Technical officer, UNFCCC Secretariat

John Godfrey
Special advisor, Climate Change, Ministry of the Environment and Climate Change

Yves Guillaume A. Messy
Lead, QGS Technologies

Claire Henly
Senior manager, Energy Web Foundation

Jason Libersky
Development lead, Xpansiv

Marc Lijour
ColliderX, Information and Communications Technology Council, Toronto French Business Network

David Livingston
Associate fellow, Energy and Climate Program, Carnegie Endowment for International Peace

Sergei Lonshakov
Team leader, Airalab, and blockchain and smart contract projects developer

Silvia Maciunas
Deputy director, International Environmental Law, CIGI ILRP

Norm Malloch
Director, Deloitte Innovation Lab

Andrei Marcu
Senior fellow, International Centre for Trade and Sustainable Development, and senior advisor, Center on Regulation in Europe

Julie Maupin
Senior research fellow, Max Planck Institute for Comparative Public and International Law, and senior research fellow, CIGI

Maria Netto
Lead specialist, capital markets and financial institutions, Inter-American Development Bank

Axel Olearius
Gesellschaft für internationale Zusammenarbeit (GIZ)

Lawrence Orsini
Founder, LO3 Energy

Maria Panezi
Post-doctoral fellow, CIGI ILRP

David Ryfisch
Climate finance advisor, Gesellschaft für internationale Zusammenarbeit (GIZ)

Gunita Saini
Product manager and technical lead, Deloitte Innovation Lab

Tejas Sawant
SolarCoin Foundation

Marcela Scarpellini
Lawyer, right. based on science

Dominik Schiener
Co-founder, IOTA

Alexey Shadrin
Russian Carbon Fund

Katie Sullivan
Managing director, International Emissions Trading Association

Russell Verbeeten
Principal operations and product lead, ConsenSys

Julianna Wei
L03 Energy

Jim Whitestone
Assistant deputy minister, Environmental Programs Division, Ministry of the Environment and Climate Change

Iliana Oris Valiente
Founder, ColliderX

Cao Yin
Founding partner and chief strategy officer, Energy Blockchain Labs

About CIGI

We are the Centre for International Governance Innovation: an independent, non-partisan think tank with an objective and uniquely global perspective. Our research, opinions and public voice make a difference in today's world by bringing clarity and innovative thinking to global policy making. By working across disciplines and in partnership with the best peers and experts, we are the benchmark for influential research and trusted analysis.

Our research programs focus on governance of the global economy, global security and politics, and international law in collaboration with a range of strategic partners and support from the Government of Canada, the Government of Ontario, as well as founder Jim Balsillie.

À propos du CIGI

Au Centre pour l'innovation dans la gouvernance internationale (CIGI), nous formons un groupe de réflexion indépendant et non partisan qui formule des points de vue objectifs dont la portée est notamment mondiale. Nos recherches, nos avis et l'opinion publique ont des effets réels sur le monde d'aujourd'hui en apportant autant de la clarté qu'une réflexion novatrice dans l'élaboration des politiques à l'échelle internationale. En raison des travaux accomplis en collaboration et en partenariat avec des pairs et des spécialistes interdisciplinaires des plus compétents, nous sommes devenus une référence grâce à l'influence de nos recherches et à la fiabilité de nos analyses.

Nos programmes de recherche ont trait à la gouvernance dans les domaines suivants : l'économie mondiale, la sécurité et les politiques mondiales, et le droit international, et nous les exécutons avec la collaboration de nombreux partenaires stratégiques et le soutien des gouvernements du Canada et de l'Ontario ainsi que du fondateur du CIGI, Jim Balsillie.

Centre for International
Governance Innovation

67 Erb Street West
Waterloo, ON, Canada N2L 6C2
www.cigionline.org