

## Factsheet

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### Overview of blockchain applications for climate action

The blockchain technology or more generally its underlying distributed ledger technology (DLT) shows a great potential for applications supporting international efforts to combat climate change. As a simplification, however, we are using the very common term «blockchain» in this text as a placeholder for the much broader concept that includes all distributed ledger technologies, even though blockchain is only one implementation of DLT.

In 2015 more than 190 countries adopted the first-ever universal, legally binding global climate deal, the Paris Agreement on Climate Change. The agreement sets out a global action plan to put the world on track to avoid dangerous climate change by limiting global warming to well below 2°C.



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In order to achieve the mentioned temperature goal, the Paris Agreement established a process where countries are required to subsequently submit their **nationally determined contributions (NDC)**. These NDCs contain plans to reduce national GHG emissions over time. Progress of these

mitigation efforts will have to be transparently reported by all countries from 2020 on using the concept of **national GHG inventories**.

In order to facilitate the implementation of NDCs, the Paris Agreement enables **voluntary cooperation between countries, including GHG markets**, allowing them to make use of market based approaches such as the joint realization and exchange of GHG reductions between countries. The Paris Agreement also established a path for increased **climate finance** from developed to developing countries. Two of the most fundamental challenges facing the Paris Agreement are to ensure that different countries exchange information on their greenhouse gas (GHG) emissions safely and transparently, as well as take responsibility for their promised actions. In this regard, there are many ways how blockchain technology can support the instruments established under the Paris-Agreement and therefore support the combat against climate change:

- *Nationally determined contributions, NDC*: Blockchain technology can facilitate the preparation, communication and maintenance of successive and mitigation relevant parts of NDCs. The nationally determined nature of NDCs has led to the fact that many climate plans are heterogenous in form and approach. For instance, GHG reductions goals may be set as absolute targets or as relative targets (based on the economic developments of the respective country). Furthermore, many NDCs contain conditional targets, which will only be achieved if additional and external funding is made available. Blockchains provide the possibility for countries to share data while retaining control of the related protocols. And the emerging developments of smart contracts within the blockchain space may provide an elegant and efficient solution to writing necessary rules for meeting NDC targets on a blockchain based system in the future.



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- *National Greenhouse gas inventories:* Blockchain technology can help to manage flows of GHG relevant data for the establishment of national GHG inventories. National inventories inform about the emissions of a country by converting underlying data (e.g. consumption of coal, oil or gas) into corresponding GHG emissions. A great potential for the use of blockchain technology for GHG inventories is its capability to manage the exchange of large data flows between different data sources including machines and sensors (Internet of Things, IoT). Another promising field of future blockchain relevance may be the calculation of emissions from forests. Smart contracts that manage data originating from forest relevant activities (logging, wood transports) and/or from satellites could facilitate the monitoring, reporting and verification of forestry projects.
- *Voluntary cooperation between countries, incl. GHG markets:* Over the past decade, numerous jurisdictions around the world have established market based mechanisms like cap and trade systems for GHG emissions or have introduced carbon taxes or levies. The Paris Agreement enables countries to cooperate and interact with each other in a way that, that e.g. achieved GHG reductions may be transferred from a selling country to a buying country. Blockchain technology could ensure a comprehensive integration of various systems, including national cap and trade systems or tax frameworks. A universal ledger (or a set of different blockchains which are able to communicate with each other) could ensure the simplification of trading as well as avoid double accounting of emission reductions and double taxation of GHG emissions.



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- *Climate Finance for mitigation and adaptation:* Developed countries promised to mobilise USD 100 billion per year by 2020 and extend finance until 2025. Blockchain technology may provide means for enhanced transparency in terms of climate finance flows while at the same time ensuring that funding reaches intended recipients and that their impact is tracked. Smart contract-based allocation of climate finance can guarantee donors that their contributions are used exclusively for their purpose. Similarly, the risk may be reduced that financially supported projects, policies and programs misuse their contributions. The capabilities of the blockchain technology to ensure transparent peer-to-peer transactions without the need for intermediaries could increase the efficiency of corresponding climate finance projects and may lead to a greater engagement by the private sector (included but not limited through new levels of crowdfunding).

**Potential for Adaptation:** Potential applications of the future may address all of the above-mentioned fields, including adaptation. Such adaptation measures could for example be achieved using blockchains at local, subnational, regional and international levels. Governments may use smart contracts to link them to microcredits. Particularly vulnerable populations can be rewarded by providing real-time information about current weather conditions, which in turn enables better aid in climate-related disaster scenarios.

**Concrete Use Cases:** It is still early stage for use cases that specifically address the tools and instrument of the Paris Agreement. The reason for that is that the implementing provisions for the Paris Agreement are currently negotiated by over 190 countries and are scheduled to be concluded only by the end of 2018 at COP24 in Poland. In addition, due to the UN context, many of these instruments are managed by Governments themselves. Nevertheless, government-backed initiatives in South America and Asia already confirm a growing interest in the future role of the blockchain technology for the development of national climate policies. However, the underlying challenges which are covered by the Paris Agreement have already been the focus of some (non-governmental) use cases. In the following, we provide a few examples of recent use cases:

One of the first use cases in the area of **GHG Inventories** (2016) was **REDDchain** (see Sustainable Land Use under <https://climateledger.org/en/Innovation/Use-Cases.33.html>). REDDchain aims at integrating satellite data into smart contracts that trigger or seize payments depending on the corresponding satellite information. The forest sector provides for more use cases such as **Gainforest** (<http://gainforest.org/>). The project won the hack4climate competition at COP23 in Bonn in 2017). Gainforest introduced an innovative system of bringing donors and caretakers together in order to protect and maintain dedicated areas off the amazon. Gainforest developed a machine learning algorithm which analyses satellite and on-the-ground data from the past to predict the areas at risk for the future. On-the-ground-data is the main focus of **Qiru** ([www.qiru.solutions/](http://www.qiru.solutions/)) - a project that combines modern communication technology and DLT in order to fight illegal logging activities in the Amazon region.

One of the first blockchain based use case in the area of **GHG markets** was **DAO "Integral Platform for Climate Initiative"** ([www.ipci.io/](http://www.ipci.io/)). The project provides a trading platform for environmental assets such as GHG offset credits within the DAO IPCI blockchain ecosystem.

Within the wider field of **Climate Finance** early movers are **Climatecoin** (<https://climatecoin.io/>) and **CarbonX** (<https://www.carbonx.ca/>). These projects facilitate the peer-to-peer purchase of GHG emission reductions at a competitive cost while promoting renewable energy and energy efficiency projects in developing countries.

The Climate Ledger Initiative (CLI, [www.climateledger.org](http://www.climateledger.org)) aims at providing objective and technology neutral information with regard to current and future climate-relevant applications which are based on distributed ledger technology. The work of the CLI is financially supported by the Governments of Liechtenstein and Switzerland as well as by the EU's Innovation Program Climate-KIC.

