DECA

Collaboration, decentralization and digital democracy: the three keys to combating climate change

Decentralized Carbon Credit Economy

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Abstract

DECA creates a green economy which digitally signs carbon credits in a blockchain. At this stage, emission reduction through carbon credits is controlled by a few market players: multinational companies and governments. Without a free market or access to people, the impact and purpose of the Paris Agreement is minimized, which is to reduce global emissions by 50% by 2050. Furthermore, current NDCs are not nearly sufficient to reach the Paris Agreement mitigation target. We propose to introduce a dapp which crypto-democratize the carbon credits by a proof-of-trust mechanism. Accumulators deploy their carbon credits in the chain and miners vote by the dapp (consensus mechanism), the block with the highest amount of trust will be the next block to be added by the chain. Changing the original proof-of-work from Satoshi's Bitcoin, creating a more eco-friendly technology (ASIC proof) and solving the double spending issue by the most trusted parties that integrate signed credits into a block. Aside from the proof-of-trust mechanism, we use a side chain called lightning network to get faster transactions and still use the main chain for holding these snapshots of where the DECA's are timestamp stored. This solves speed problems within the main chain and consensus mechanism. Supporting climate mitigation goals, the proposal reduces the DECA's emission per block each time by a considerable percentage of reduction in CO2 realized. As Bitcoin, DECA emissions will reduce gradually. The design includes achievements of the CO2 reduction assigned to a number of blocks. These achievables imply the gradual reduction of the DECA's emission and incremental demand in the signed carbon credits that comprise a block.

Contents

Acronyms

AMA	Ask me anything
ASIC	Application-Specific Integrated Circuit
CDM	Clean Development Mechanism
CDP	Carbon Disclosure Project
CEC	Clean Energy Certificate
CERs	Certified Emission Reductions
CH4	Methane
CO2	Carbon dioxide
CO2e	Carbon dioxide equivalent
CORSIA	Carbon Offsetting and Reduction Scheme for International Aviation
CSR	Corporate Social Responsibility
CC	Carbon Credits
DAO	Decentralized Autonomous Organization
DApp	Decentralized Application
ERU	Emission Reduction Unit
ET	Emissions Trading
ETS	Emissions Trading System
EU	European Union
EU ETS	European Union Emissions Trading System
GHG	Greenhouse gas
GoO	Guarantees of Origin
HFC	Hydrofluorocarbon
ICAO	International Civil Aviation Organization
ICG	The Climate Group
IETA	International Emissions Trading Association
IMO	International Maritime Organization
IPCI	Integral Platform for Climate Initiatives
JI	Joint Implementation
MITO	Mitigation Token
MtCO2	Metric tons of carbon dioxide
MtCO2e	Metric tons of carbon dioxide equivalent
N2O	Nitrous oxide
NDC	National Determined Contribution
P2P	Peer to peer
PFC	Perfluorocarbon
PoW	Proof of Work
LN	Lightning Network
REC	Renewable Energy Certificate
SF6	Sulphur hexafluoride
UK	United Kingdom
USD	United States Dollar
VCS	Verified Carbon Standard
WEF	World Economic Forum

Disclaimer

The white paper that follows is the plan created by Neetsec & Partners to create DECA; a structure for a distributed carbon credit economy built on the concept of transparency brought about via blockchain technology. This white paper is built as the founding block for various ideas and discussion and is not intended to be a final project script, but a new beginning from which the technological and market concepts can evolve. This paper is written in a way to encompass the major technological and sociological concepts as well as the challenges and opportunities that DECA may face. This is not a prospectus or a call to invest in our project, it is a paper which discusses the benefits and approach of creating a currency out of carbon credits. Legal challenges will be mentioned in the portion on called Regulations & Legal oversight. This is not a solicitation for investment.

Synopsis

DECA is an ecosystem that is created as a transparent construct for companies to be able to legitimize their carbon credit processes amongst consumers as well as their own jurisdictional requirements. DECA offers the possibility for carbon credits to be attributed to the blockchain instead of traded to the government in exchange for tokens which can be sold/traded and exchanged like a digital currency. The DECA ecosystem can be utilized to assist countries to act upon the requirements of the Paris agreement. Under the Paris Agreement, every country submitted an individual plan, also called national determined contributions (NDC), to tackle its greenhouse gas emissions with an agreement to meet regularly to review their progress.

However, the Paris Agreement only consists of certain provisions that are legally binding. Thus, countries tailored their climate plans to their domestic situations and alter them as circumstances changed. One clear issue is that the aggregate pledged emission reductions in the current NDCs are not nearly sufficient to reach the Paris Agreement mitigation target. Furthermore, there are no penalties for non-compliance. The hope was that, through peer pressure and diplomacy, these policies would be strengthened over time. Despite the need for global carbon reduction, the USA, a global leader, withdrew from the Paris Agreement. This severely undermined the core purpose of the agreement. In order to regain trust and emphasize the importance of the Paris Agreement, the DECA ecosystem is created.

DECA will be a step forward to battle climate change, by creating a global participation platform for carbon credits. DECA proposes a dapp which cryptographically democratizes the carbon credits through a proof-of-trust mechanism. Carbon credits owners deploy their carbon credits into the chain and miners vote by the dapp (consensus mechanism), the block with the highest amount of trust will be the next block to be added by the chain. Changing the original proof-of-work from Satoshi's Bitcoin, creating a more eco-friendly tech (ASIC proof) and solving the double spending issue by the most trusted parties that integrate signed credits into a block. Aside from the proof-of-trust mechanism, DECA uses a side chain called lightning network to

get faster transactions and still use the main chain for holding these snapshots of where the DECA's are timestamp stored, this solves speed problems within the main chain and consensus mechanism.

In addition to the aforementioned perspectives, it is noteworthy that the DECA project functions under guidance by Neetsec and their partners for a period of 3 years, during which it will build a platform for self-governance. Throughout the guiding years, a series of goals and participation will be met in order to transfer governance towards the community. This system will be built on the function of blockchain smart contracts and will be progressively turned into a distributed carbon community, through democratic and cryptographic elements. In conclusion, DECA believes that when global actors utilize the DECA ecosystem and acknowledge, collaborate and act upon the Paris Agreement, they can build a sustainable future, today.

Legal Notice

DECA is an open source project fielded by companies linked to carbon credits, in an attempt to make carbon credits profitable without government incentives. Excessive profits or loss of value are not controlled by DECA, its partners or community.

1. Introduction

This introduction aims to provide the reader insights into carbon credit types and the carbon credit industry. The following subsections outline the basics of carbon credits and its current market stage in order to give recommendations if and which certificates are viable to back the cryptocurrency DECA. After the first chapter, the DECA project will be introduced.

1.1 Carbon credit types

Carbon offsets are generated by projects which conduct emission reduction activities and are normally measured in metric tons of carbon dioxide equivalent, tCO2e. These certificates can be traded on compliance or voluntary markets.[1]

Carbon markets are mentioned the first time since the Kyoto Protocol (1997), a treaty to set in which developed countries (Annex 1) were required to set targets beginning in 2008.[2] The Kyoto Protocol introduced three market-based mechanism, creating what is now called carbon market[3]

- Joint Implementation (JI)
- Clean Development Mechanism (CDM)
- Emission Trading (ET)

In order to fulfill its targets, the countries may purchase/transfer emission reduction units (offsets) from projects (JI and CDM) of non-annex I countries which aim to reduce emissions caused by human activities.[4] Thus, the certificates generated by those projects were “Certified Emission Reductions” (CERs) and “Emission Reduction Unit” (ERU).

For the purpose of understanding carbon markets, it is important to recognize the difference between compliance markets (ET) and a voluntary market, and it’s commodities allowances and offsets.[5] Allowances are used in compliance markets whereas the offsets or carbon credits

1 Ecosystem Marketplace. (2018). Voluntary Carbon Markets Insights: 2018 Outlook and First-Quarter Trends. 10/04/2019, de Ecosystem Marketplace Web site: https://www.forest-trends.org/wp-content/uploads/2018/09/VCM-Q1-Report_Full-Version-2.pdf

2 United Nations. (1998). KYOTO PROTOCOL TO THE UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE . 10/04/2019, de United Nations Web site https://unfccc.int/sites/default/files/kpeng.pdf

3 United Nations. (1998). KYOTO PROTOCOL TO THE UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE. 10/04/2019, de United Nations Web site: https://unfccc.int/sites/default/files/kpeng.pdf

4 United Nations. (1998). KYOTO PROTOCOL TO THE UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE . 10/04/2019, de United Nations Web site: https://unfccc.int/sites/default/files/kpeng.pdf

5 Exergia. (2007). Voluntary Market Diagnosis. 07/04/2019, de Exergia Web site: http://exergia.gr/wp-content/uploads/voluntary-carbon-market-diagnosis.pdf

are used in voluntary schemes which are project based.[6] The World Bank defines as carbon market instruments, all instruments which put a price on GHG emissions. It distinguishes between ET, carbon taxes, offset mechanisms and result-based climate finance.[7]

In 2018, there were 21 ETS covering 28 jurisdictions in place. The largest compliance market is the European Emission Trading System (EU ETS), operating since 2005. The compliance market forces companies to reduce emissions or to purchase emission allowances and the emission cap which will be reduced each year to fulfill the emission targets of each entity.[8] Since then, California (2012), Quebec (2013), South Korea (2015), Ontario (2017; since repealed by change in government) implemented a compliance system. Furthermore, 26 carbon taxes primarily implemented on national level were in place.[9]

The voluntary market includes all offsets traded which are not emission allowances in a compliance system. Some offsets are also allowed to a certain degree in the compliance market like ERUs (until 2012) and CERs (until 2020).

The Paris Agreement has been ratified in October 2016 and is going to replace the Kyoto Protocol in 2021. The target of this agreement is to maintain level of warming to 1.5°C and to limit warming to 2°C above pre industrial levels. The Paris Agreement requires all parties to prepare NDC and to implement domestic measures to reach the target. The article 6 of the Paris Agreement will reform the national and continental carbon markets as it designs market based mechanism to replace the Kyoto Protocol (JI, CDM, ET).[10] The main difference to the Kyoto Protocol is that it doesn't restrict certain types of approved units and the units will have common standards and accounting practices.

According to Carbon Pulse, governments only agree to core elements of global guidance on international ET established in article 6 of the Paris Agreement. The rules have to be accepted by almost 200 nations but they still have different views on the contents of article 6.[11] This article establishes two types of carbon markets: First, the cooperative approach (art. 6.2 – 6.3) and

6 WWF. (2008). Making Sense of the Voluntary Carbon Market A Comparison of Carbon Offset Standards. 10/04/2019, de WWF Web site: https://www.co2offsetresearch.org/PDF/SEI-wwf_standcomp_080305%20_web.pdf

7 World Bank Group. (2018). State and Trends of Carbon Pricing 2018. 10/04/2019, de World Bank Group Web site: https://openknowledge.worldbank.org/bitstream/handle/10986/29687/9781464812927.pdf?sequence=5&isAllowed =y

8 Exergia. (2007). Voluntary Market Diagnosis. 07/04/2019, de Exergia Web site: http://exergia.gr/wp-content/uploads/voluntary-carbon-market-diagnosis.pdf

9 World Bank Group. (2018). Carbon Pricing Dashboard. 10/04/2019, de World Bank Group Web site: https://carbonpricingdashboard.worldbank.org/

10 United Nations. (2018). What is the Paris Agreement?. 10/04/2019, de United Nations Web site: https://unfccc.int/process-and-meetings/the-paris-agreement/what-is-the-paris-agreement

11 Carbon Pulse. (2018). CARBON FORWARD 2018: Will international carbon trade thrive under the Paris Agreement?. 10/04/2019, de Carbon Pulse Web site: CARBON FORWARD 2018: Will international carbon trade thrive under the Paris Agreement?

the sustainable development mechanism (art. 6.4 – 6.7) which could help to reach the NDCs.[12] A market based mechanism could include any country unlike the CDM, where developed countries could purchase ERU from developing countries.[13]

Since the ratification of the Paris Agreement, public concern about climate change has grown. Thus, many individuals, institutions and companies are looking for ways to reduce their carbon footprint. A cost effective way to do this is the voluntary compensation through buying and retiring voluntary carbon offsets from the market so that they cannot be resold again. The process of buying and removing carbon credits is called offsetting and a market for voluntary carbon offset has emerged in the last few years.[14]

In the early stage of the carbon markets, project developers used their own methodology to calculate the emission reduction but today, as more voluntary carbon standards have been established, the project developers follow the rule of the standard they want to acquire. The voluntary carbon standards require that the project developer require an independent third party validation and verification to assure that they have achieved the emission reduction. These standards require that the offsets are real, additional, measurable and verifiable.[15]

In 2018, there were voluntary carbon projects in 83 countries. Over the years, more and more voluntary carbon standards appeared such as the "Voluntary Carbon Standard" (VCS), which has been established by The Climate Group (ICG), the International Emissions Trading Association (IETA) and the World Economic Forum (WEF). It is an international voluntary GHG offset program.[16]

The Gold Standard has been established in 2003 due to the lack of rules in CDM and JI projects. This new standard should identify and encourage well-designed activities to reduce GHG and apply best practice.[17]

12 Chinese Roots Global Impact. (2019). International carbon markets under the Paris Agreement: Basic form and development prospects. 10/04/2019, de Chinese Roots Global Impact
Web site: https://www.sciencedirect.com/science/article/pii/S1674927819300188

13 Ecosystem Marketplace, 2016: State of the Voluntary Market 2016. Online.

14 Carbon Offset Watch: Assessment Report Authors Chris Riedy & Alison Atherton Institute for Sustainable Futures © UTS 2008

15 Ecosystem Marketplace. (2018). Voluntary Carbon Markets Insights: 2018 Outlook and First-Quarter Trends. 10/04/2019, de Ecosystem Marketplace Web site: https://www.forest-trends.org/wp-content/uploads/2018/09/VCM-Q1-Report_Full-Version-2.pdf

16 Stockholm Environmental Institute. (2011). Verified Carbon Standard. 10/04/2019, de Stockholm Environmental Institute
Web site: https://www.co2offsetresearch.org/policy/VCS.html

17 Gold Standard. (2019). FAQ. 10/04/2019, de Gold Standard Web site: https://www.goldstandard.org/resources/faqs

Plan Vivo Standard focuses on rural smallholders and communities with the objective to reduce rural poverty.[18] The standards are updated periodically and new standards are developed.

List of the most important voluntary carbon standards which exist today:[19]

- VCS
- VER+
- Plan Vivo
- Gold Standard
- Panda Standard
- American Carbon Standard
- Social Carbon Methodology
- ISO 14064

1.2 Market participants and voluntary carbon offset lifecycle

The voluntary market has several participants with public and private institutions as buyers and project developers as sellers: brokers and retailers, who are on both, buyer and seller side; independent verifiers are essential participants as well, since they measure the emission reduction of the projects and the administrator of the voluntary carbon standard credits.
On the buyer side, there are companies like American Electric Power, Ford Motor Company, HSBC, Google and DuPont. In 2006, the term "carbon neutral" reached mainstream status as small and midsize companies, fortune 500 companies were purchasing offsets and airlines offering flight emission compensation to their customers.[20] Voluntary buyers purchase offsets to get carbon neutral or reach their own environmental goals. Their motivation is not based on regulations and are not following any rules or guidelines.

According to ECOHZ, some reasons to compensate emissions are:[21]

- reduce your risk
- build or improve your reputation
- demonstrate leadership
- meet your 'customers' or 'suppliers' demands
- stand out from your competitors

18 Plan Vivo. (2013). The Plan Vivo Standard. 10/04/2019, de Plan Vivo Web site: http://www.planvivo.org/docs/Plan-Vivo-Standard.pdf

19 Ecosystem Marketplace. (2008). Offsetting Emissions: A Business Brief on the Voluntary Carbon Market . 10/04/2019, de Ecosystem Marketplace Web site: https://www.bsr.org/reports/BSR_Voluntary-Carbon-Offsets-2.pdf

20 Ecosystem Marketplace. (2008). Offsetting Emissions: A Business Brief on the Voluntary Carbon Market . 10/04/2019, de Ecosystem Marketplace Web site: https://www.bsr.org/reports/BSR_Voluntary-Carbon-Offsets-2.pdf

21 ECOHZ. (2018). Carbon Offsets. 10/04/2019, de ECOHZ Web site: https://www.ecohz.com/renewable-energy-solutions/carbon-offset/

According to Ecosystem Marketplace (2008), the engagement in the voluntary market includes the following steps:[22]

1. Measure emissions
2. Set offset goals within a climate change strategy
3. Clarify expectations about the benefits of offsetting vs. emission reductions
4. Choose offset desired attribution
5. Explore the range of offset offerings
6. Choose offset provider
7. Communicate actions

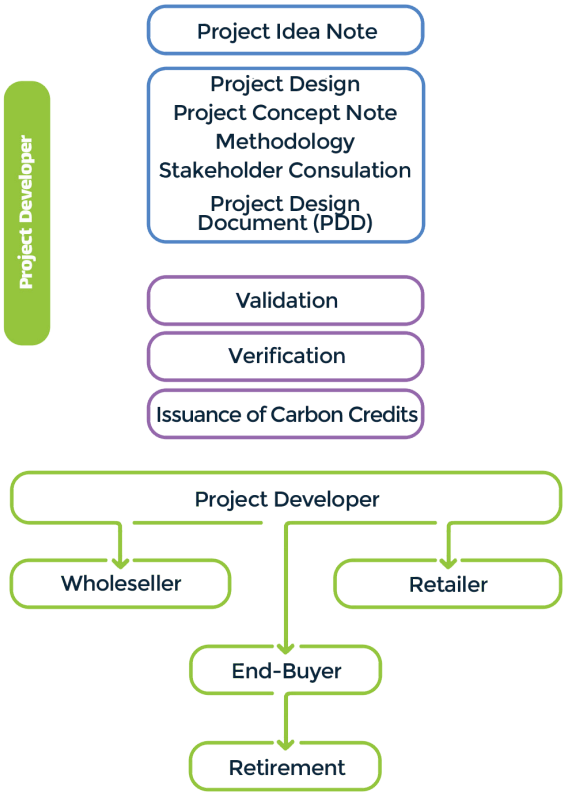


Illustration 1: Carbon Credit Process; Source: United Nations

As illustrated in the above image, in order to receive carbon credits the project developer has to verify the emission reduction achieved by an independent third-party. Each standard (Gold Standard, Plan Vivo, VCS) has its own approved methodology that defines the rules the project developer must follow.[23] The project developer is able to decide which standard he wants to issue his certificates.

22 Ecosystem Marketplace. (2008). Offsetting Emissions: A Business Brief on the Voluntary Carbon Market . 10/04/2019, de Ecosystem Marketplace Web site: https://www.bsr.org/reports/BSR_Voluntary-Carbon-Offsets-2.pdf

23 Ecosystem Marketplace. (2017). Unlocking Potential State of the Voluntary Carbon Markets 2017. 10/04/2019, de Ecosystem Marketplace Web site: https://www.forest-trends.org/wp-content/uploads/2017/07/doc_5591.pdf

Nowadays, the standards do not only require emission reduction but other benefits like biodiversity, forest protection which is called co-benefit. Carbon credits have to prove additionality, avoid double counting and have a realistic calculated baseline.[24]

The issued carbon credit has a unique identification number. After issuing the carbon credits which can take years, the project developer must find buyers. As there is no single market place for voluntary offsets, the project developer can sell the carbon credits to retailers, resellers and end-buyers. In practice, when a carbon credit is sold from the project developer to a reseller or retailer, the carbon credit changes ownerships on the registry and is transferred from the project developer account to the reseller account. If the carbon credit is sold to the end-buyer, the certificate will be cancelled or retired on the registry which is the way to reduce the emissions of the end-buyer. To avoid double counting, the registry marks the carbon credit as retired.[25]

1.3 The carbon credit industry

In the last few decades, there has been a rise in importance attached to carbon management and corporate responsibility. During the 2017 year, over 1,300 companies disclosed that they were using an internal carbon pricing method to better document their decision making. Furthermore, there are over 100 Fortune 500 companies with a collective worth of 7 trillion USD, which have disclosed their carbon pricing initiative.[26]

Recently, the market value of ETS and carbon taxes has experienced strong growth; during the 2018 period, ETS and carbon taxes reached a value as high as 82 billion USD. Compared to the 56 billion USD market of 2017, this is a 56% increase. Governments increased their carbon pricing revenue from 22 billion USD in 2016, to 33 billion USD in 2018. These revenues are mainly taken from the following 3 branches: allowance auctions, compliance obligation payments, and carbon tax receipts.[27]

24 Exergia. (2007). Voluntary Market Diagnosis. 07/04/2019, de Exergia
Web site: http://exergia.gr/wp-content/uploads/voluntary-carbon-market-diagnosis.pdf

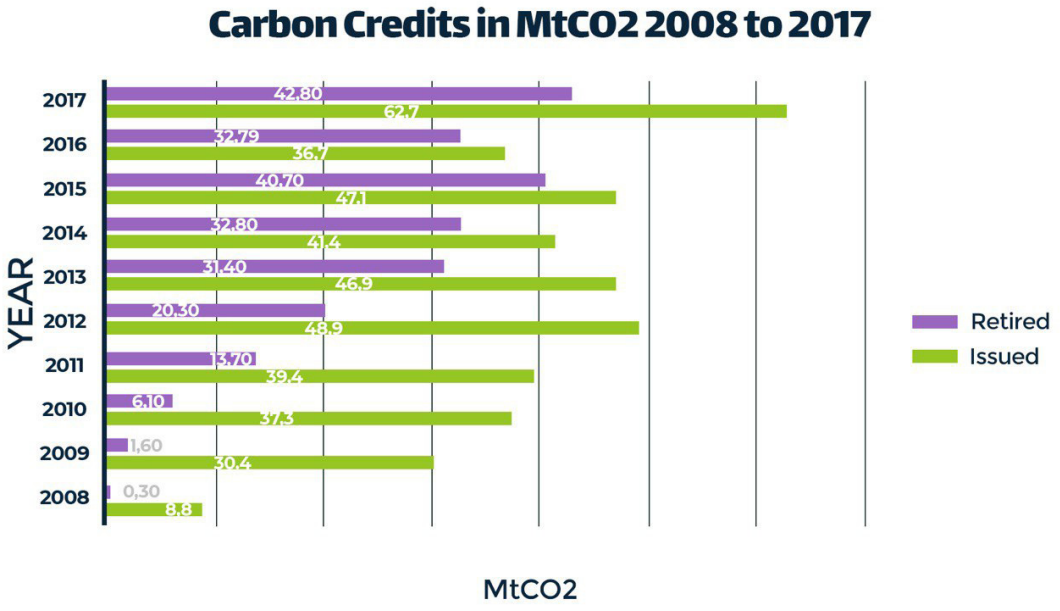
25 Ecosystem Marketplace. (2017). Unlocking Potential State of the Voluntary Carbon Markets 2017. 10/04/2019, de Ecosystem Marketplace Web site: https://www.forest-trends.org/wp-content/uploads/2017/07/doc_5591.pdf

26 Carbon Disclosure Report. (2019). Carbon Pricing: CDP Disclosure Best Practice. 10/04/2019, de Carbon Disclosure Report
Web site: Confidential

27 Ecosystem Marketplace. (2017a). BUYING IN: TAKING STOCK OF THE ROLE OF OFFSETS IN CORPORATE CARBON STRATEGIES. 10/04/2019, de Ecosystem Marketplace
Web site: https://www.forest-trends.org/wp-content/uploads/imported/buyers-report-2016-final-pdf.pdf

1.3.1 Market size

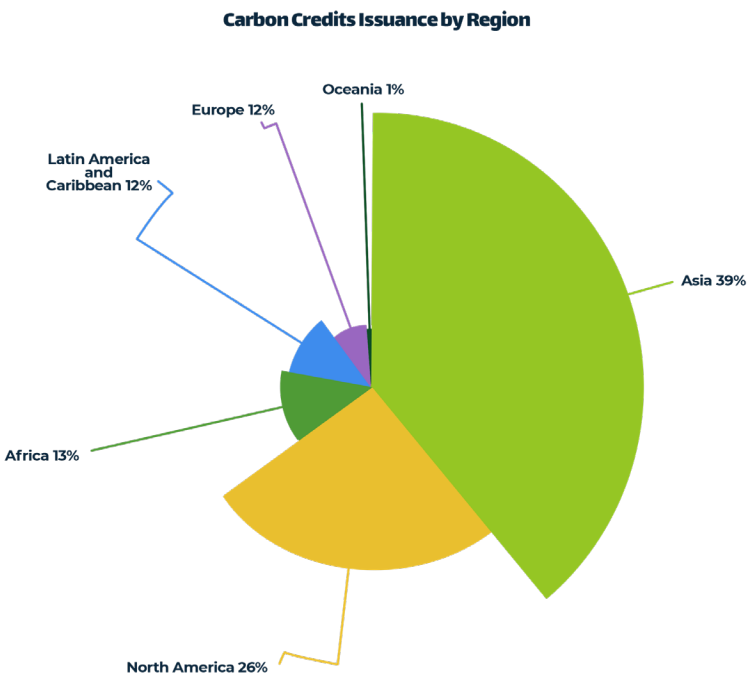
The demand for carbon offsets to compensate emissions on voluntary basis commenced before 2005 and increased rapidly in the first years and amounted to a value of almost $100 million in 2006.[28] Between 2008 and 2017, more than 400 MtCO2e carbon credits have been issued. Only 236 $MtCO_2$ have been retired in this period which represents 56 % of the certificates issued. After signing the Paris Agreement, the interest in voluntary compensation increased which shows the graphic below. As voluntary markets are not transparent, it is only possible to get public data from institutions which offer the retirement of carbon credits. This graphic does not consider carbon credits used in compliance markets.



Source: VCS, CAR, Gold Standard, Plan VIVO, VERs; Amounts in million MtCO2

Most of the carbon credits are issued in Asia and North America, summarizing 65 % of certificates issued in the period 2008 to 2018. Voluntary offset projects are in certain countries but not in others. The main reasons are driven by compliance in the market. If there is a compliance market implemented, there is less need for voluntary compensation. The EU ETS regulates the sectors which produce carbon projects; thus, it is not possible to reduce emissions on a voluntary basis. As consequence there are fewer projects in Europe.

28 Ecosystem Marketplace. (2008). Offsetting Emissions: A Business Brief on the Voluntary Carbon Market . 10/04/2019, de Ecosystem Marketplace Web site: https://www.bsr.org/reports/BSR_Voluntary-Carbon-Offsets-2.pdf



Source: VCS, CAR, Gold Standard, Plan VIVO, VERs.

In the United States and Australia the situation is different. As there were many projects before the compliance market was established, project developers hoped that the project offsets were eligible for the California and Australian cap and trade system. Indeed, the California regulator allowed several voluntary projects to convert in compliance projects. The factors beyond the emission reduction potential like forest and biodiversity protection are another reason which influences the project location and increases the attractiveness as revenue of carbon offsets are used to protect forests. Furthermore, clean cookstove projects are in rural areas where households rely on smoky cookstoves. Buyers often choose project locations close to their operating plant to offset those emissions or simply projects with the lowest offset price.[29]

Some regions favour certain offset projects. In 2016, most of the methane offsets were from projects in United States and Canada whereas Asian offsets were from renewable energy projects. African, Latin American and Caribbean countries had predominantly offsets from forest and land-use projects.[30]

Carbon Credits can be categorized by project type. This table shows the different project types with volume of carbon credits issued between 2008 and 2018:[31]

29 Ecosystem Marketplace. (2017). Unlocking Potential State of the Voluntary Carbon Markets 2017. 10/04/2019, de Ecosystem Marketplace Web site: https://www.forest-trends.org/wp-content/uploads/2017/07/doc_5591.pdf

30 Ecosystem Marketplace. (2017). Unlocking Potential State of the Voluntary Carbon Markets 2017. 10/04/2019, de Ecosystem Marketplace Web site: https://www.forest-trends.org/wp-content/uploads/2017/07/doc_5591.pdf

31 Ecosystem Marketplace. (2018). Voluntary Carbon Markets Insights: 2018 Outlook and First-Quarter Trends. 10/04/2019, de Ecosystem Marketplace Web site: https://www.forest-trends.org/wp-content/uploads/2018/09/VCM-Q1-Report_Full-Version-2.pdf

Project type	Projects with carbon credits issued	Volume of carbon credits issued
Agriculture	87	6.7 MtCO2e
Chemical Processes	72	63.5 MtCO2e
Energy Efficiency	633	127.9 MtCO2e
Forestry and Land Use	170	95.3 MtCO2e
Household Devices	161	23.4 MtCO2e
Renewable Energy	611	61.9 MtCO2e
Transportation	43	1.1 MtCO2e
Waste Disposal	238	57.5 MtCO2e

Table: Issuance of carbon credits per project type 2008 to 2018. Source: Ecosystem Marketplace.

This table shows that there have been 437.5 MtCO2e carbon credits issued to reduce emissions in the period 2008 to 2018.

The price range has been between 0.5 USD to more than 50 USD in the last years, even in the institutions.

The following factors affect the carbon credit price:[32]

- Project costs (based on location and activity)
- Buyer's preferences (country, certificate type, vintage)
- Quantity

The table below gives an overview of carbon credit transactions in 2016 by project type and its average price per credit. Be aware that one carbon credit can be sold more than one time as the project developer sells the certificates to brokers and the broker resell them to other brokers, retailers and end users:[33]

32 Ecosystem Marketplace. (2018). Voluntary Carbon Markets Insights: 2018 Outlook and First-Quarter Trends. 10/04/2019, de Ecosystem Marketplace Web site: https://www.forest-trends.org/wp-content/uploads/2018/09/VCM-Q1-Report_Full-Version-2.pdf

33 Ecosystem Marketplace. (2018). Voluntary Carbon Markets Insights: 2018 Outlook and First-Quarter Trends. 10/04/2019, de Ecosystem Marketplace Web site: https://www.forest-trends.org/wp-content/uploads/2018/09/VCM-Q1-Report_Full-Version-2.pdf

Project type	Volume	Average price per credit
Renewable	18.3 MtCO2e	1.4 USD
Forestry and Land Use	13.1 MtCO2e	5.1 USD
Methane	5.6 MtCO2e	1.8 USD
Energy Efficiency	4.5 MtCO2e	2.9 USD
Household Devices	3.4 MtCO2e	5.2 USD
Transportation	1.9 MtCO2e	0.3 USD
Gases	1.4 MtCO2e	5.7 USD
Other	0.5 MtCO2e	4.0 USD

Table: Trading of Voluntary Market Project Types. Source: Ecosystem Marketplace.

Standards	Volume	Average price per credit	Value
Verified Carbon Standard	12.2 MtCO2e	2.5 Euros	31.1 M Euros
Gold Standard	391 KtCO2e	3.9 Euros	20.5 M Euros
Plan Vivo	4.5 MtCO2e	7.5 Euros	3.0 M Euros
Clean Development Mechanism	3.4 MtCO2e	3.6 Euros	1.3 M Euros

Table: Trading Volume of Voluntary Market Standards 2016. Source: https://www.ecostarhub.com/wp-content/uploads/2017/06/State-of-European-Markets-2017-Voluntary-Carbon.pdf

This table shows the market value of voluntary carbon standards in 2015. It is clear that almost 70 % of the offsets sold are coming from VCS followed by the Gold Standard. The large market share of VCS can be explained by the nature of the offset as VCS was the first standard to issue a REDD+ methodology with large-scale projects. Hence, VCS is selling large volumes. Plan Vivo has a small market value due to the nature of the offsets. They only verify community forestry and land-use projects which are smaller-scale projects which can achieve a higher price per offset.[34]

1.3.2 Top buyer

While carbon offset projects are distributed around the world, the end-buyers are typically from “Annex 1” countries according to the Kyoto Protocol. As reported by the Carbon Disclosure Project (CDP), companies which introduced an internal carbon price in their business strategy increased from 150 in 2014, to over 1,300 companies in 2018. CDP asks companies if they are subject to a mandatory carbon pricing system (ETS, carbon tax, cap & trade) and if they bought

34 Ecosystem Marketplace. (2017). Unlocking Potential State of the Voluntary Carbon Markets 2017. 10/04/2019, de Ecosystem Marketplace Web site: https://www.forest-trends.org/wp-content/uploads/2017/07/doc_5591.pdf

project-based carbon credits in the reporting period and more specific information like credit type, project location and quantity and credits cancelled.[35]

In 2015, CDP asked 1,836 (60 companies excluded) companies to get data about their activities in 2014. Information was obtained on 38% of the total demand in 2014 pursuant to an Ecosystem Marketplace report in 2015. Almost 30% of these companies belonged to the bank, diverse financial and insurance sector followed by consumer good and retail (9%), technology (8%) and airlines (5%). 98 companies (almost 50%) were based in Europe and 44 companies (22%) in United States.[36]

In line with a questionnaire in 2015 by Ecosystem Marketplace in which 59 organisations headquartered in Europe with sales activities throughout the world, European companies are demanding the largest carbon credits for voluntary compensation in the world. In this year, they transacted 39.2 $MtCO_2$ of voluntary carbon offsets. This volume doesn't meet the volume retired or issued shown in the graphic, as carbon credits can be sold a lot of times until the end-buyer retires the carbon credit on the independent registry.

The largest volume transacted were from organisations based in UK with 19.8 MtCO2, followed by Germany with 5.5 $MtCO_2$ in second place and Switzerland with 5.5 $MtCO_2$ in third place. [37]

In 2016, 48 % of carbon credits for voluntary compensation have been sold to Europe and 38 % to North American buyers. Other regions like Latin America and Caribbean (5%), Oceania (9 %) had smaller amounts in comparison to the two main regions. In comparison with previous years , new buyers appeared in Europe, North America, Latin America and Caribbean which bought smaller amounts which is normal for first time buyers. In 2016, five key sectors purchased 75 % of the carbon credits:[38]

- Energy (29 %)
- Finance/Insurance (17%)
- Consumer goods (17%)
- Events/Entertainment (6%)
- Utilities (6%)

35 Carbon Disclosure Report. (2019). Carbon Pricing: CDP Disclosure Best Practice. 10/04/2019, de Carbon Disclosure Report
Web site: Confidential

36 Ecosystem Marketplace. (2017a). BUYING IN: TAKING STOCK OF THE ROLE OF OFFSETS IN CORPORATE CARBON STRATEGIES. 10/04/2019, de Ecosystem Marketplace
Web site: https://www.forest-trends.org/wp-content/uploads/imported/buyers-report-2016-final-pdf.pdf

37 Ecosystem Marketplace. (2017). Unlocking Potential State of the Voluntary Carbon Markets 2017. 10/04/2019, de Ecosystem Marketplace Web site: https://www.forest-trends.org/wp-content/uploads/2017/07/doc_5591.pdf

38 Ecosystem Marketplace. (2017). Unlocking Potential State of the Voluntary Carbon Markets 2017. 10/04/2019, de Ecosystem Marketplace Web site: https://www.forest-trends.org/wp-content/uploads/2017/07/doc_5591.pdf

1.3.3 Trends

In the last years the following trends could be observed:

The demand for carbon credits originated from **JI and Clean Development projects are almost exhausted**. The biggest demand came from the European Union Emission Trade System.[39] The future of CDM projects under the Paris Agreement is still unclear. The market activity (project registration and issuance) is decreasing. In 2017, China (38%), India (14%) and the Republic of Korea represented the countries where the most cancelled CERs were coming from. Korea must be mentioned as special case as cancelled CERs can be reissued to be used in the Korean compliance market. [40]

- The International Civil Aviation Organisation (ICAO) is designing a **Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA)** to address emissions from international flights which are responsible for about 2% of human induced emission worldwide. ICAO will determine the certification type, vintage and project type eligible for the emission increases above 2020 level. Around 3 billion offset credits may be necessary between 2021 and 2035.[41]

- International shipping is not covered under the Paris Agreement and accounts for 2 % of worldwide GHG. **International Maritime Organization (IMO)** plans to reduce shipping emissions 50% by 2050, compared to 2008 levels. If a market-based measure is launched in 2023, there might be additional demand for international carbon credits.[42] In fact, the Gold Standard has developed the first approved methodology to generate carbon credits for the marine industry. [43]
- The demand on carbon credits depends on the supply. There are several **initiatives** (e.g. World Economic Forum's Gigaton Initiative) which call upon the private sector to support investments in natural climate solutions which would also add carbon credit demand.

39 Ecofys. (2016). CARBON PRICING WATCH 2016. 10/04/2019, de Ecofys
Web site: https://openknowledge.worldbank.org/bitstream/handle/10986/24288/CarbonPricingWatch2016.pdf

40 World Bank Group. (2019). State and Trends of Carbon Pricing 2018. 10/04/2019, de World Bank Group
Web site: https://openknowledge.worldbank.org/bitstream/handle/10986/29687/9781464812927.pdf?sequence=5&isAllowed=y

41 IETA. (2018). IETA INSIGHTS Q3/2018. 10/04/2019, de IETA
Web site: https://www.ieta.org/resources/Resources/GHG_Report/2018/IETA%20Insights%20Q4_2018.pdf

42 IETA. (2018). IETA INSIGHTS Q3/2018. 10/04/2019, de IETA
Web site: https://www.ieta.org/resources/Resources/GHG_Report/2018/IETA%20Insights%20Q4_2018.pdf

43 Akzo Nobel. (2016). Carbon Credits: A Marine Industry First. 10/04/2019, de Akzo Nobel
Web site: https://www.green-marine.org/wp-content/uploads/2017/06/John-Mangano.pdf

- There is a tendency to implement a hybrid market. The Colombian carbon tax allows fuel importers and producers to comply with domestic carbon credits. Asian countries like Indonesia, India, South Korea are establishing carbon markets which might include voluntary offsets.[44]

- **Countries establish local voluntary markets**. Normally, the carbon offsets have been sold to international end-buyers, but governments of countries like Colombia, France, UK and Korea are creating domestic voluntary markets to boost the demand of local offsets.[45]

- Buyers and voluntary standards do not only focus on emission reduction in projects but **co-benefits are a new trend**. The Gold Standard 3.0 is looking for co-benefits from gender to water and biodiversity protection where as other standards offer the emission of voluntary offsets with a social impact.[46]

- In recent years internal carbon pricing has become a tool for companies to manage potential climate-related risks. Tools, developed by companies like Trucost, are assessing the potential impact of carbon pricing on financial metrics and competitiveness.[47] However, a **technological evolution** is taking place, with innovative tools presenting a new era for carbon pricing. Utilizing **blockchain technology** has been in the forefront of many conversations in order to extend the participation of small groups and individuals. Even United Nations is thinking about blockchain to improve carbon emission trading, enhanced climate finance flows and avoidance of double counting.[48] According to Ecosystem Marketplace, there is a big potential to expand voluntary markets and reduce the barriers of small buyers through transparent, distributed ledger to aggregate small buyers to offset their carbon footprint.[49]

44 IETA. (2018). IETA INSIGHTS Q3/2018. 10/04/2019, de IETA
Web site: https://www.ieta.org/resources/Resources/GHG_Report/2018/IETA%20Insights%20Q4_2018.pdf

45 Ecosystem Marketplace. (2018). Voluntary Carbon Markets Insights: 2018 Outlook and First-Quarter Trends. 10/04/2019, de Ecosystem Marketplace Web site: https://www.forest-trends.org/wp-content/uploads/2018/09/VCM-Q1-Report_Full-Version-2.pdf

46 Ecosystem Marketplace. (2016). State of the Voluntary Carbon Markets 2016. 10/04/2019, de Ecosystem Marketplace
Web site: https://www.forest-trends.org/publications/raising-ambition/

47 Trucost. (2017). The Trucost Corporate Carbon Pricing Tool. 21/04/2019, de Trucost
Web site: https://www.trucost.com/corporate-advisory/carbon-pricing-tool/

48 United Nations. (2017). How Blockchain Technology Could Boost Climate Action. 21/04/2019, de United Nations
Web site: https://unfccc.int/news/how-blockchain-technology-could-boost-climate-action

49 ketplace. (2018). How Blockchain Can Make Carbon Markets More Accessible. 21/04/2019, de Ecosystem Marketplace
Web site: ecosystemmarketplace.com/articles/how-blockchain-can-make-carbon-markets-more-accessible/

1.3.4 Key drivers

The following chapter describes the key drivers of the voluntary market:

Economic growth: Economic growth has a positive correlation with energy consumption which means if the economy is growing, companies consume more energy and emissions increase. As consequence, companies offset more emissions and awareness about climate change increases.

Energy Efficiency: Energy Efficiency affects voluntary offset similar as economic growth as it is influencing emission levels directly. Improvements in energy efficiency decrease the demand for offsets.

Weather: The weather can be an important driver of voluntary offset demand. Extreme high or low temperature leads to higher electricity consumption due to the use of air cooling and heating. Another important factor is the availability of renewable energy sources.

Regulatory Uncertainty: If offset can be used in compliance markets, project developers will focus on offset generating for those markets. Hence, less offsets might be available for voluntary compensation.

Policy Initiatives and Programs: The Kyoto Protocol and Paris Agreement were two important factors that made people aware of climate change. Such an effect has been seen especially after the ratification of the Paris Agreement when the offset demand increased dramatically. Offsetting is also mentioned in the Sustainable Development Goals by the United Nations. Goal 7 about affordable and clean energy mentions offsetting as a measure to reduce carbon dioxide emissions.[50] Even the withdrawal of the United State of the Paris Agreement in 2020 doesn't affect the voluntary market as there isn't any nationwide compliance markets and local initiatives increase the offset demand.[51]

Summarizing the market analysis, the voluntary market is increasing since adopting the Kyoto Protocol and especially due to the ratification of the Paris Agreement. Currently, more than 400 $MtCO_2$ had been reduced thanks to offsets. As carbon offsets only are traded on the secondary market, there is a lack of transparency. Market data is collected due to market reports by Ecosystem Marketplace, CDP, Bloomberg and Thomson Reuters. Hence, there is a wide price range even if average prices might be below 10 USD per unit. Due to the lack of certain characteristics of the JI and CDMs, other offset standards have been developed. This makes it more challenging for companies to find the right offset. To use carbon credits as

50 United Nations. (2018). The Sustainable Development Goals Report 2018. 10/04/2019, de United Nations Web site: https://unstats.un.org/sdgs/files/report/2018/TheSustainableDevelopmentGoalsReport2018-EN.pdf

51 Ecosystem Marketplace. (2018). Voluntary Carbon Markets Insights: 2018 Outlook and First-Quarter Trends. 10/04/2019, de Ecosystem Marketplace Web site: https://www.forest-trends.org/wp-content/uploads/2018/09/VCM-Q1-Report_Full-Version-2.pdf

backup for a cryptocurrency, the following recommendations should be considered:

- The most liquid offsets are VCS and Gold Standard. The project types with the biggest demand are renewable energies and forestry. These carbon credit types are appropriate as backup for the cryptocurrency DECA. Nevertheless, it is important to analyze the market periodically and know about current market trends.

- More than 85 % of the offsets are bought in Europe and North America by 5 key sectors (energy, utilities, entertainment and events, finance and consumer goods). Every year new companies are appearing supported by the market key drivers.

- New markets like CORSIA and international shipping are opening big opportunities. Furthermore, a lot of countries are implementing local markets which will create more demand in the next years. It is important to observe those markets and which certificates are demanded.

- As there are other similar certificates like Renewable Energy Certificates (RECs), Guarantees of Origin (GoO) and Clean Energy Certificates (CEC), it is necessary to consider these certificates and integrate them step by step as backup for the cryptocurrency.

- By defining the backup of the cryptocurrency, the following factors must be considered:
  - Changing retirement quantity: What does it mean for the cryptocurrency if the retirement quantity is increasing/decreasing?
  - Prices: How do changing offset prices affect the cryptocurrency?
  - Vintage: Which vintage will be chosen? (two-year-old maximum)
  - Does DECA consider buying this carbon credits and sell them later and act as broker?

2.General actors & ecosystem + tokenomics

There will be the following actors in the ecosystem:

Carbon credits issuer (CCI): 51%
A physical or moral person who owns a carbon credit and wants to convert it to DECA through the DAPP.

Miners / decentralized verifiers: 38%
Individuals which vote on carbon credits. If there is a lack of trust regarding the carbon credit, these individuals can provide a low qualification or vote against the issued carbon credit.

Node owner: 5%
A person who supports the infrastructure of DECA, adding a node that must be available at all times and with a good bandwidth-time online. All this to encourage decentralization.

Decentralized Autonomous Organization (DAO): 5%
A decentralized autonomous organization that provides maintenance, in all aspects, to DECA. The first three years, this DAO will be managed by IHS and NSI, and then released to people considered by the miners and voters.

Non-profits or charitable organizations with environmental concerns: 1%
Independent agents which seek on daily basis the conservation of the environment through programs, projects, and global initiatives.

Similar to Bitcoin and other cryptographically generated currencies 'mined' by the concept of proof-of-work, DECA operates on a confidence test of the validity and unclaimed carbon credits. To ensure that the carbon credits entered onto the blockchain are valid, there is a constant (automated) revision of the credits. These evaluation serves to ensure the quality and the validity of the claimed credits. It is called DECA's proof-of-trust mechanism.

2. 1 DECA percentage distribution

DECA will be generated via block rewards per carbon credit. In the first instance, the carbon credit issuer receives rewards for a percentage of 51%; then, voters in the consensus mechanism will receive 38%. A further 5% will be distributed amongst the nodes in the order of connectivity duration and total bandwidth. Another 5% will be distributed to the developers and staff working for the DAO. Finally, the last 1% will be assigned to different non-profits or charitable organizations with environmental concerns. These will be selected and voted upon by the community once per year.

The DECA blockchain will be decentralized by embedding itself in thousands of computers worldwide. It will distribute itself, by ensuring a network of users and rewarding holders of nodes to stay online and maintain the system. The upholder of the DECA network will also be able to vote via the same mechanism as the blockchain. In other words, the blockchain works via wallets, which allow individual parties to vote.

In order to promote and enforce the stability of the DECA blockchain, the software will automatically attribute a 5% per block to the network nodes. This works by measuring bandwidth and connectivity duration. Doing so will provide DECA with a strong and decentralized network without network shortages.

There is a consensus regulation system for listing the carbon credits that are planned to be integrated into the blockchain. The intention is that the issuers of carbon credits promote this confidence by integrating these credits with DECA. The certified user will vote about the carbon credits listed in order to ensure trust in the issuer (its infrastructure and seriousness). The miner has to access DECAs DAPP in order to interact with the consensus system.

As mentioned before, the rewards per block (mining) that are generated in the ecosystem DECA are based on a percentage distribution to the different users that comprise it. This gives a percentage to each DECAs operations and that they are distributed according to their importance, their participation and their intention in the chain.

The value of DECA will depend on monetizing it's value with respect other currencies. DECA wants to maintain an independent system based on the three previous points for its valorization. Thus, it can potentialize DECA as more stable, decentralized cryptocurrency, designed to increase its value, just like Bitcoin does.

The economic structure proposed for DECA is based on three fundamental factors, which in turn, may influence its value:

1. *Algorithm*
2. *Carbon Credits*
3. *Markets*

Algorithm

The algorithm supporting the system behind DECA aims to consolidate and seeks a constant rise in its value, in a curve that can guarantee that all mined tokens are increasingly more complex to generate. This helps to create an incremental currency with a higher difficulty to mine, while the amount of the issued tokens will be smaller.

Carbon credits

Carbon credits are currently valued differently, depending on project costs (based on location and activity), buyer's preferences (country, certificate type, vintage) and quantity and hence, the nation or entity that issues them. In order to ensure a stable value for DECA, the average carbon credit price is taken. Thus, a base is established that supports the token and prevents it from dropping to zero, something that has happened to other currencies that do not have a backup like backing commodities.

Markets

Currently, crypto currencies are valued by means of supply and demand in exchange systems that cause their price volatility. It should be noted that the free market avoids the total dependence on nations or entities. By adding the integration of the markets to DECA, we will manage to decentralize and make the value of our currency more independent. Achieving a hybrid system (markets + carbon credits), which is solid by the issuers of carbon credits but at the same time is free market through decentralized systems.

2.2 ITDE: Initial Token Distribution Event

Initially, the currencies can be obtained by: DECA ITDE, exchange, ERC20 among others. Once, the blockchain is started, the user might obtain the cryptocurrency through exchanges or carbon credits. Having a carbon credit, the owner has to notarize the carbon credit on behalf of DECA. Subsequently, the carbon credits must be integrated into the DAPP in order to mine DECA.

In order to ensure a secure technical mining process, the carbon credits will be voted by the community, digitally signed and integrated into the chain of blocks. After integrating the carbon credits in the blockchain, the user receives DECA on its wallet. This process is called confidence test.

According to DECA, the impacts of utilizing blockchain and decentralized technologies create unity between buyers, sellers and producers. The DECA ecosystem creates a market in which everyone earns by participating in the reduction of carbon emissions, from the ITDE onwards.

The answer is not centralizing carbon credits but making a platform that will revolutionize the way a crypto currency is mined and remove the problems that the carbon credits currently have. DECA is based on the community of trust who, by consensus, will be decided which blocks we trust and how we are really doing a change for the world.

2.3 From DECA token to DECA

When DECA token becomes DECA the genesis block which will contain all the carbon credits collected so far by the IHS fund, as well as the DECA tokens issued during the ITDE. Both partners will sustain this economy for three years, while developing a DAPP with the achievements of the first fundraising event. After this period, new members will be democratically voted to release the platform.

2.4 DECA is open source and has no enemies

DECA is not competing with any cryptocurrency. It is an alternative proposal that seeks to create a green economy being decentralized, democratic and collaborative. The project seeks to strengthen the Paris Agreement and the objectives to reduce CO_2 in the world by accepting and retiring carbon credits. Chapter 4 will shed light on the competitive environment DECA operates in. Providing insights in projects that have distinctive features but also share similarities with the DECA project.

2.5 Business model & DAO

To assure the continuity of the DECA ecosystem, DECA pays back it's developers via a 5% reward per block mined. Each 5% will be attributed to a specific development wallet which is maintained by the DECA development team. These wallets will be used to reward development, maintenance and collaborators via bounty programs, which exist only to give back to the community.

The system of bounty is put into place to fully decentralize the DECA platform and have it function as a decentralized autonomous organisation (DAO). DECA decision making starts with the system of bounty which is put into place to fully decentralize the DECA platform and have it function as a DAO. DECA decision making starts with a centralized control by the NeetSec development team with their owner Hydrogen with an intent to decentralize and give back control to the community with well defined smart contract platform, and tools for the community to decide for itself. The goal stated to develop the community while building the blockchain's capacity for self governance.

The 5% will be used for the following:

- Open source development and maintenance of source code
- Development and maintenance of plugins and facilitators for their integration
- Debugging and vulnerabilities testing
- Revision of carbon credits/certificate admissibility
- Documentation and translations

The method of distribution is made to be rewards and bounties in order to encourage integration and collaboration from around the world. These tasks will be tallied together and will receive bounties after the project is completed. The concept being that by offering bounties and pay-per-work individuals from around the globe are free to participate and be paid according to their ability. This is done to promote an international collaboration of talents as well as respect the nature and philosophy of free software.

The rewards vary based on the quality, effectiveness and time for delivery, with a bonus incentive program built-in to reward quality and timely delivery. There will be fines for products that are lacking in effectiveness or need to be fixed shortly after being initially solved. In case of higher then expected quality, the nature of the DAO allows for greater rewards, being subjective to the voting power of the community.

2.6 What issue does DECA solve

The current markets that allow carbon credits transactions have a duty to ensure that a reductions or removal of CO_2 has taken place. The current procedure of such transaction includes a supplier of offsets to find one or more counterparties to purchase their produced offsets. However, this is considered to be a labor and time intensive process, including various third parties such as governmental institutions, brokers or consultants. The matching of counterparties may be considered to be a barrier that prevents both buyers or suppliers from participating in the carbon removal industry. The DECA-ecosystem is the first step forward in easing this process.

In addition, DECA seeks to create a fair and transparent way for parties to easily participate in a low-carbon economy. The goal being that individuals can participate and generate wealth by the value of carbon credits being emitted. With DECA individuals are part of the carbon credit process and can vote on the way that they are generated, used and allocated. This means that the DECA community members can use the platform to enhance the scientific rigor of their local jurisdiction, or to seek validation of a carbon credit from one jurisdiction into another. The DECA blockchain seeks to redress the wrongs of carbon emissions by adhering to the principles of *the protocol*, by opening the process of the Paris Agreement to a worldwide audience.

3. General technologies that gives functionality to DECA

In addition to the blockchain, DECA requires lightning networks to guarantee secure and fast transactions (no need to validate blocks). DECA proposes to change the work test (PoW) by its own block validation mechanism based on the consensus test (PoT consensus). Given that the work test is a voting system to validate and give weight to the most important blocks, DECA encountered the problem that these consensuses are slower (since they depend on humans) than the original thesis of Satoshi Nakamoto[52] (PoW). Furthermore, they reduce energy consumption, are eco-friendly, are more democratic, propose a more equitable distribution of rewards and promote the inclusion of actors within the community.

Blockchains handle a very limited number of transactions per second.[53] Given this arises the lightning network, which proposes the off-chain paradigm: which DECA uses as the main method for transfers between its users. DECA takes the blockchain for a different purpose, containing snapshots of transactions as well as of cancelled carbon credits. In this way, DECA maintains the backbone of DECA and support the cryptocurrency by absorbing a percentage of the carbon credits economy.

3.1 Proof-of-trust mechanism

These are constant assessments of carbon credits that intend to enter the DECA blockchain. This is where all the users that mine this currency guarantee with their confidence, electronically sign the transaction, as well as corroborate that those canceled carbon credits are notarized in the name of DECA.

The mechanism consists of:

1. The “carbon credits issuers” will submit their carbon credits to be voted on: an interface to upload data related to their carbon credits.
2. A list of the candidate blocks to be integrated in the chain: interface for general access in all the wallets, in addition to their DECAs.
3. The miners will have access to the list (2) of available credits and will evaluate them following certain parameters: an interface to vote for the blocks in this list (where a confidence test will be given by signing and qualifying them).
4. A DAPP in the wallet that supports the management of points 1, 2 and 3.
5. The infrastructure manages a series of nodes that contain a percentage (sharding) of the blockchain and a network availability rating. This promotes decentralization.

52 Satoshi Nakamoto. (not defined). Bitcoin: A Peer-to-Peer Electronic Cash System. 23/04/2019, de Satoshi Nakamoto
Web site: https://bitcoin.org/bitcoin.pdf

53 Bitcoinist. (not defined). Bitcoin. 23/04/2019, de Bitcoinist
Web site: https://bitcoinist.com/bitcoin-transactions-per-second-approaching-all-time-high/

3.2 How does DECA solve the problem of double spending?

The use of the voting mechanism towards the most trustworthy cancelled carbon credits is proposed. The blocks are formed with a number of the credits that have the highest confidence given by the miners and which will be the first to be integrated into the chain. In addition, a snapshot of the lightning network to keep a secure control of these transactions will be added to each block.

If the expense exists at the same time in a transaction or a duplicate credit, it will be resolved by different rounds of voting, which can give extra incentives to the miners.

Finally, the nodes must contain a percentage (sharing) of said blockchain to ensure decentralization, in addition to which, their incentives will be given according to a system of measurement of availability.

3.3 DECA DAPP

The DECA DAPP is a decentralized application based on blockchain technology providing users with a user-friendly interface. The DECA DAPP will provide the following:

1. A portfolio containing the amount of DECA
2. An easy to use upload interface for users to integrate their carbon credits into the blockchain
3. A potential candidate list of blocks which will be integrated into the blockchain by the CCMR
4. An interface to vote for blocks in this list (where a confidence proof will be given by signing them).

The system of consensus is important as it generates a democratic network, which attaches value to each carbon credit that integrates the blockchain. The confidence testing seeks to give a voice to each DECA holder, with a one member one vote system to ensure equity and reliability towards carbon credit integration.

3.4 Lightning network properties

Instant Payments. Lightning-fast blockchain payments without worrying about block confirmation times. Security is enforced by blockchain smart-contracts without creating an on-blockchain transaction for individual payments. Payment speed measured in milliseconds to seconds.

Scalability. Capable of millions to billions of transactions per second across the network. Capacity blows away legacy payment rails by many orders of magnitude. Attaching payment per action/click is now possible without custodians.

Low cost. By transacting and settling off-blockchain, the lightning network allows for exceptionally low fees, which allows for emerging use cases such as instant micropayments.

Cross blockchains. Cross-chain atomic swaps can occur off-chain instantly with heterogeneous blockchain consensus rules. So long as the chains can support the same cryptographic hash function, it is possible to make transactions across blockchains without trust in 3rd party custodians.[54]

3.5 Flowchart to validate a block and integrate it into the chain

1. Generate a block with the carbon credits (CC) with the most confidence: voted by more miners and having more qualification in favor.
2. Review if there is no double expense or double carbon credit integration.
3. If it is the case, make a second round of voting until it is resolved that a block acquires priority.
4. Integrate the block to the chain and distribute it to all the nodes (either as sharding or full).
5. A qualification is assigned for the carbon credit account in the blockchain thanks to the participation and confidence of the miners.

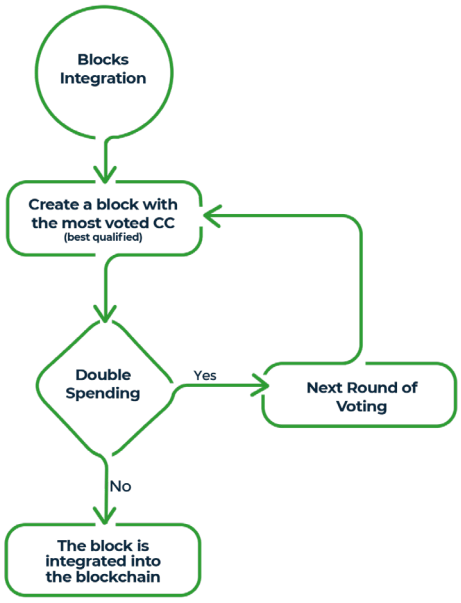


Diagram 3.5

54 Lightning Network. (not defined). Lightning Network Scalable, Instant Bitcoin/Blockchain Transactions. 23/04/2019, de Lightning Network Web site: https://lightning.network/

3.6 General DECA proof of trust consensus Model

1. The carbon credits issuer must integrate the canceled CC to DECA.
2. The miners select the CCs they trust the most (based on the information), where they qualify and vote.
3. A candidate block containing the most voted CCs is generated.
4. It is verified that other blocks do not contain the same CC or duplicate transactions (avoidance of double spending).
5. The CCs are signed, added to the blockchain and distributed through all nodes, DECA core, and wallets; In addition, a snapshot of the current state of the transactions in the chain is made (this includes the lightning network).
6. The issued DECA's when the block is integrated are distributed to the participants according with their respective percentages (see Tokenomics).
7. Users who have DECA's can transfer them between accounts through the lightning network.

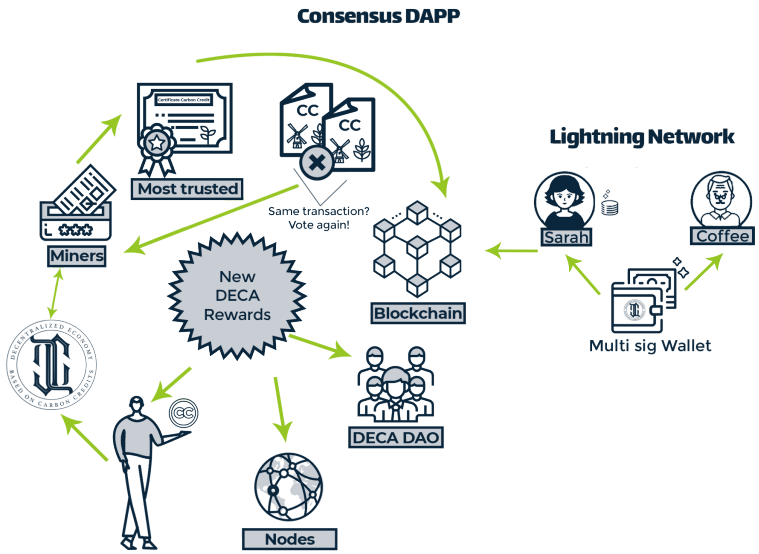


Diagrama 3.6[55]

3.7 Flowchart to integrate a carbon credit

1. Create an account as carbon credits issuer in the DECA webwallet (it must be public to inspire confidence in the miners).
2. Cancel the carbon credits and, if possible, notarize the cancellation.
3. Cryptographically sign the cancellation and, if possible, the digital version of the notarization.
4. The carbon credits issuer integrates into its wallet data of the canceled CC (signature of

55 Source: DECA advisor in Carbon Credit Market and Design team

the CC, signature of cancellation, from what backlog it comes, its value, among others) and is signed with its wallet.

5. Wait for voting and confirmation.
6. If the voting was successful and it was integrated into a block, next to be added to the blockchain. If it is integrated into the candidate block and added to the chain, it returns a percentage in DECA to:
   - Carbon credits issuer
   - Miners
   - Other actors involved in the DECA system
7. In case of irregularities, all aggregating CCs will have an expiration date and those with the lowest rating will be taken. If it is not integrated, the CC issuer has the right to try to integrate it in two extra occasions. If the third is rejected, it will be banned and it will not be possible to reinstate it in the future.

Note: Based on this system, a mechanism of supply and demand is calculated so that the DECA algorithm auto-adjusts the difficulty and the number of DECA's that it emits per block.

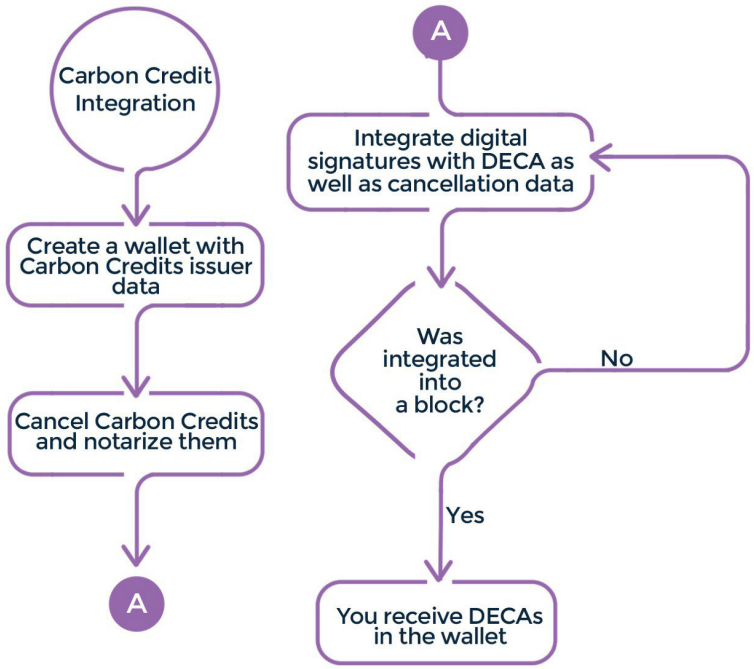


Diagram 3.7

3.8 Flowchart for voting and mining

1. The user does not necessarily have to have a public account to vote, but he has to have transactions in the chain of blocks that show that he has an active profile in DECA.

2. It is corroborated by security mechanisms that the user is not a robot (bot), this is made with the purpose of avoiding attacks or manipulations in the confidence test.
3. The wallet includes a Dapp, which lists the blocks that are being graded and evaluated. It is convenient to look for the blocks that are closest to being integrated into this chain or that are going through important voting rounds. We emphasize the importance of the miner using its ethics and rigor to verify that the CC does not affect the chain of blocks. This gives confidence to the entire DECA community.
4. Based on (3) and on historical points, a reputation as a miner is created that helps give greater weight to his votes in the form of an incentive.

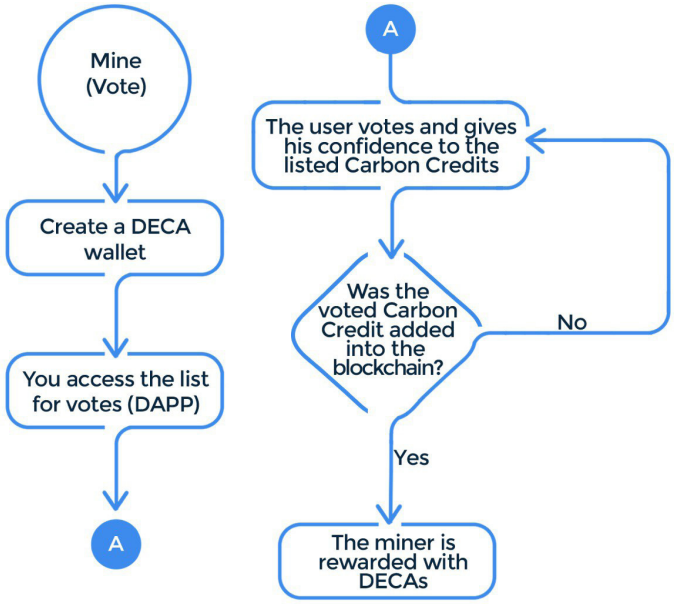


Diagram 3.8

3.9 General structure diagram of DECA

1. Lightning network
2. Blockchain DECA
3. Miners
4. DAPP of votes and listings
5. Actors

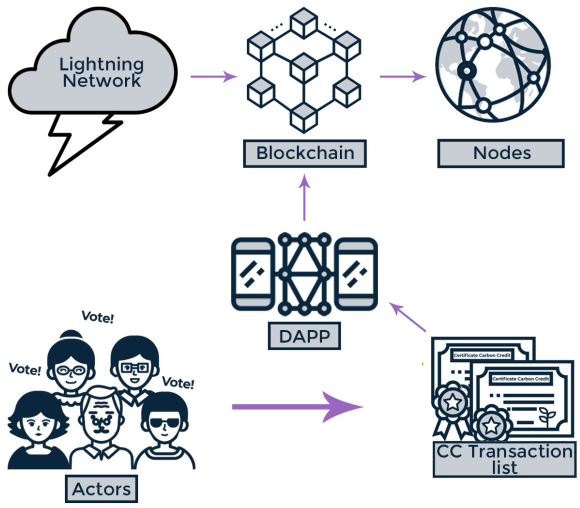
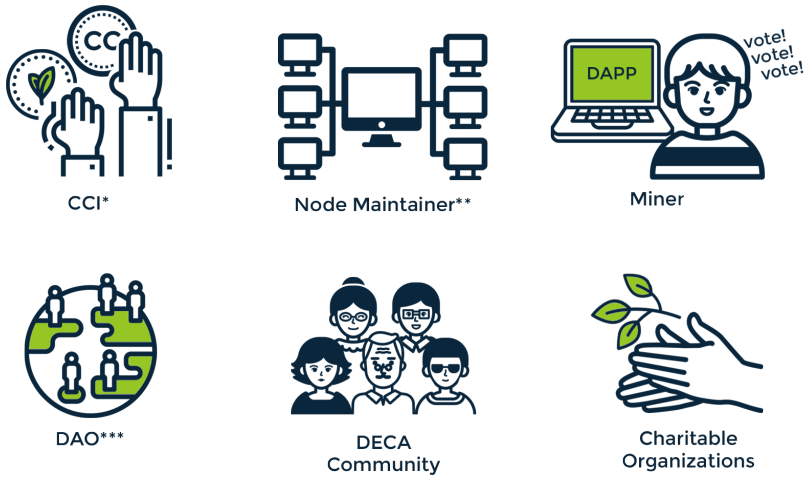


Diagram 3.9[56]

3.10 Actors in DECA and how they interact

1. Carbon credits issuer
2. Miners
3. Node maintainers
4. DAO (NSI & IHS)
5. Community
6. Non-profits or charitable organizations



* Integrates canceled CC
** Helps mantain the Blockchain descentralized
*** Organize and listen the community. Will be formed by community after 3 years

Diagram 3.10[57]

56 Source: DECA advisor in Carbon Credit Market and Design team

57 Source: DECA advisor in Carbon Credit Market and Design team

3.11 SideChain LN and how it handles the use of DECA in addition to snapshots

1. Blockchain DECA
2. Snapshot mechanism
3. Lightning network

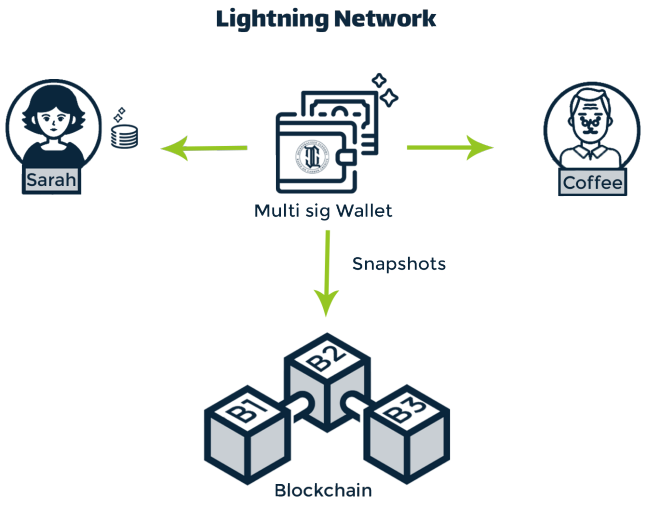


Diagram 3.11[58]

58 Source: DECA advisor in Carbon Credit Market and Design team

4. DECA & similar projects

DECA values transparency, therefore wants to shed light on the competitive environment it operates in. The following subsections will provide insights in projects that have distinctive features but also share similarities with the DECA project.

4.1 Carbon X

The initiatives of CarbonX enable businesses to support consumers in making eco- friendly choices. These decisions may range from choosing eco-friendly products to using eco friendly services such as car sharing. The CxTs tokens are stored and tracked through a mobile-app and can be traded amongst consumers and exchanged within the CarbonX network for carbon friendly goods, services or for other digital currencies. Similar to DECA, CarbonX aims to tokenize the carbon industry. However, in contrast to CarbonX, DECA is not just tokenizing the carbon industry, but rather creates an entire ecosystem around it in order to ensure the stability of its token. In addition, CarbonX provides limited insights in an actual use-case and lacks strong partners that are needed to create a strong foundation and ensure future growth.

4.2 Veridium

Veridium emphasizes upon the fact that both companies and consumers are starting to grasp the importance of respecting the value of the earth's finite resources and the role of environmental offsets such as carbon credits. Furthermore, Veridium markets itself as a blockchain-based carbon credit marketplace that enables corporations, governments and individuals to acquire, trade and account for carbon footprints and offsets. Similar to DECA, it utilizes the blockchain to turn carbon credits into easily exchangeable assets. To ensure the liquidity of its token, Veridium uses a crypto-asset marketplace. This marketplace will help automate the carbon credit accounting and offsetting process across global supply chains. Furthermore, the overarching purpose of the Veridium project is to protect the planet's natural resources and reduces the worldwide carbon emissions.

Like DECA, the Veridium marketplace tokenizes carbon credits through the usage of blockchain technology. However, in contrast the Veridium marketplace, the DECA ecosystem is strongly embedded in its community, creating a competitive edge towards similar projects. Community based ecosystems like DECA help ensure the inflow of future partners and growth of the entire ecosystem.

4.3 DAO Ipci

DAO IPCI is a decentralized autonomous organization focusing on creating an integral platform for climate initiatives. Noteworthy is that DAO IPCI is a non-profit project independent of a specific government or corporate institution. What makes DAO IPCI unique is the fact that it is a public and programmable blockchain-based ecosystem, designed for various societal cost markets and mitigation instruments. Some of these markets include: carbon markets, carbon compliance units, carbon emission allowances, offset credits, renewable energy credits and other environmental credits.

The core purpose of the DAO IPCI project is to create a blockchain based ecosystem which aims to mitigate negative societal externalities. In order to create a transparent ecosystem which is protected from manipulation of a centralized power, the DAO IPCI ecosystem is built on smart contracts. These smart contracts are designed to minimize transaction costs and to make the issuance and transfer of mitigation outcomes highly reliable. The token that is used within the DAO IPCI ecosystem is called the Mitigation Token (MITO). The MITO is intended to be a currency for executing DAO IPCI smart contracts, including placing and executing orders to buy and sell environmental units.

Similar to the DECA ecosystem, the DAO IPCI ecosystem ensures transparency and reliability of transactions, the possibility of global interactions with carbon market institutions and carbon registries. In addition, DAO IPCI also focuses on strong community building and values the initiatives and input that are provided by its community to ensure the continuity of the project. However, in contrast to DECA, it is unclear how the DAO IPCI project ensures the stability of its token.

5. DECA & the importance of community driven efforts

Carbon credits are controlled by government entities, without a free market or access to the people, they have minimized the purpose. The DECA ecosystem crypto-democratize the carbon credits by a proof-of-trust mechanism, enhancing the essence and importance of communal efforts. The DECA ecosystem is created, but also driven by, communal efforts. Therefore, DECA combines both community sourcing and utilizes the benefits of a community based economy.

DECA built the foundation of its community on a sense of unity and a spirit of togetherness, with a wish to create a sustainable future. To reach emission reduction goals, DECA stresses the importance of creating coherence and a shared vision among its community members, similar to the original ideal of the Kyoto protocol. As such, all community driven efforts are aimed to achieve brand awareness, extend the community and reinforcing the strength of its community. In order to achieve these goals, DECA will engage in community driven efforts which include: rewarding active participation in the DECA community, the DECA quality mark, the white-hacker bounty program, the annual DECA Hackathon and the DECA AMA sessions.

5.1 Earning a living by actively participating in DECA

At DECA we believe in reciprocity and in the power of engaging with the community. Therefore, DECA offers the opportunity for community members to join the DECA Green Badge program. This program is supported by IHS and aims to actively engage the community in efforts to achieve worldwide carbon reduction. Representatives of the Green Badge program get a chance to earn monetary rewards or DECA tokens. To do so, participants will assist IHS and like minded companies to push widespread adoption of their products and services, to help reduce fuel emissions while saving companies on fuel costs.

To ensure the quality of the representatives participating in the Green Badge program, participants will be selected based on motivation and expertise. In addition, participants are obligated to participate in a sales training to familiarize with the various products offered by our partners. If participants successfully complete the sales training they will eligible to earn DECA certificates and participate in the Green Badge program.

Noteworthy is that the Green Badge program consists of various stages ranging from bronze to diamond. Each of these badges are imposed upon achieving a sales target, adding to the cumulative carbon reduction goals. Furthermore, the rewards in terms monetary compensation and DECA tokens increases upon achieving a higher stage. Please note that the reduction targets set for each stage is subject to change.

Bronze: Reduction target of 10%
Silver: Reduction target of 20%
Gold: Reduction target of 50%
Platinum: Reduction target of 75%
Diamond: Reduction target of 100%

In conclusion, the DECA Green Badge program enables community members to actively participate and assist in achieving global carbon reduction goals. In addition to environmental importance of this program, the DECA Green Badge program enables community members to earn a living by actively participating within the DECA community.

5.2 Corporate Social Responsibility through the DECA ECO badge

DECA believes that providing the community with a credible quality mark enables them to make their carbon reduction and environmental driven objectives tangible. The DECA quality mark, known as the ECO Badge, is utilized by companies who aim to communicate a tangible representation of their carbon emission reduction or similar environmental driven goals.

Being part of the decentralized carbon credit economy makes companies eligible to carry the DECA ECO Badge. However, the DECA ECO Badge is to be earned by achieving carbon reduction goals. Earning the ECO Badge is relevant, as it creates a competitive edge in a world that increasingly values CSR and companies acknowledging the importance of assessing their corporate environmental footprint. Actively communicating the DECA ECO Badge will enable businesses to make their carbon reduction tangible, creating a stronger emphasis on their stance regarding their environmental footprint and their focus on CSR.

Noteworthy is that the DECA ECO Badge consists of various stages ranging from bronze to diamond. Each of these stages are imposed upon achieving a set carbon reduction goal. These carbon reduction goals are measured based on a participants total emission and include:

Bronze: Reduction target of 10%
Silver: Reduction target of 20%
Gold: Reduction target of 50%
Platinum: Reduction target of 75%
Diamond: Reduction target of 100%

In conclusion, the DECA ECO Badge will enable companies to make their carbon reduction efforts tangible by working towards monthly cumulative carbon reduction target. Upon achieving monthly set reduction targets, the DECA team will distribute the DECA ECO Badges accordingly.

5.3 The DECA Hacker program

DECA values the security and integrity of its ecosystem. Therefore, DECA continuously seeks ways to collaborate with its community to perform research and security audits. DECA provides clear bounty rewards and reporting rules in order to build a transparent and progressive security relationship between DECA and its community. Actions performed by the community should be aimed to improve or provide additional security to the DECA ecosystem. In order to create ongoing engagement with the community to promote its security, DECA is committed to closely collaborate in order to reproduce, verify and respond to legitimate reported vulnerabilities.

In order to be part of the DECA bounty program, community members could simply participate in the DECA Gitlab as good-faith security researchers. These community members aim to test the DECA network for possible vulnerabilities. Whenever a participant reports a bug or vulnerability to the ecosystem, related project or existing partner, DECA reserves the right to disclose or forward the details of the issue to the involved parties without further discussion with the participant. However, the DECA team aims to coordinate and communicate any issues to the best of its ability with all parties involved.

Whenever a report is made, DECA will investigate legitimate reports and will act accordingly to correct any vulnerability that may have been detected. To provide participants with a responsible reporting process, DECA will withhold from any legal actions, nor involve law enforcement as long as the participant complies with the DECA hacker policy. This policy withholds the participants from violating users privacy, destruction of data, and interruption or degradation of the DECA ecosystem.

In order to express appreciation towards the community for filing validated security reports, DECA has created the DECA hall of fame and the DECA bounty program. Both aim to incentivize participants who report vulnerabilities of the DECA ecosystem. The DECA hall of fame will provide an overview of the participants who have made a significant contribution to the security of the DECA ecosystem. In addition, participants may be eligible to receive a DECA bounty reward. The bounty rewards are based on the severity of the reported vulnerability. These bounties are based on community consensus and considered to be fair awards. Furthermore, these bounty rewards are non-negotiable.

5.4 The annual DECA hackathon

In order for online communities to thrive, it has become increasingly important to actively engage with the community. An effective way of creating community engagement is through various annual returning events, such as the DECA hackathon. This hackathon aims to attract both community members and developers. Participants will be challenged in an innovative proving ground to create new ideas or improvements to the DECA ecosystem. In order to foster problem-solving and risk-taking the event will be held in a casual environment.

DECA stresses the importance of community driven events as they often are the input for new product creation or create the foundation for new partnerships. During a hackathon innovative ideas are formed quickly and directly tested in front of an international jury, ensuring real life application. In addition, hackathons are not just known as a source for innovative input, but also known to deliver more brand awareness and increase brand exposure within the industry. These events will enhance the DECA brand image and create grounded associations towards innovation and community involvement.

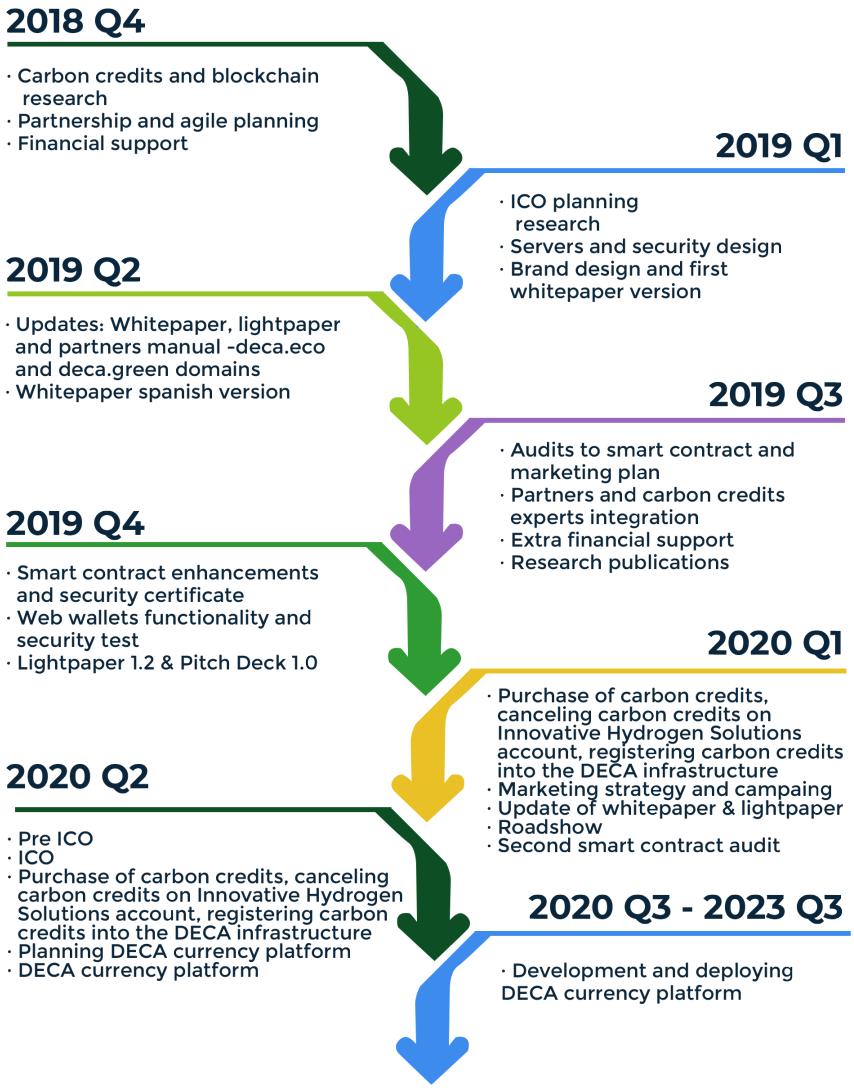
Furthermore, DECA values that during the annual hackathon, the existing ecosystem is critically reviewed from various perspectives. The nature of the DECA community will ensure the diversity of participants, which guarantees a multitude of perspectives and a uniquely productive atmosphere. The participants may range from programmers and engineers to marketers and designers. The DECA hackathon stresses the importance of participants to distil their visionary concepts down to actionable solutions.

In order for the hackathon to succeed it remains crucial to educate the participant beforehand. Leading up to the event, community admins will focus on elaborating on questions which are faced by the community. To provide the clarification needed, sample projects or cases that fit the topic and timeframe of the event will be shared beforehand. All in all, the annual DECA hackathon resolves around idea creation, problem solving, innovation, but most importantly, enhancing the coherence within the DECA community.

5.5 Community based AMA sessions

DECA values the opinions and vision of its community and therefore hosts monthly AMA sessions. These sessions will provide the DECA team of insights how the current ecosystem is being perceived and provides input regarding potential ways to improve the DECA ecosystem. Consequently, AMA's are considered to be one of the best ways to build an online community considering it is entirely community driven and promotes transparent communication. These sessions are not used for the sole purpose of community building but also used as a powerful and appealing tool to create community engagement. The AMA's that will be hosted by DECA and will likely focus on topics such as the functionality of the DECA ecosystem, partnerships, development progress and (future) updates. In addition to AMA sessions with the DECA team, DECA will include industry experts to ensure clear elaboration upon the questions provides by the community.

6. Roadmap



Since November 2018, a general idea about optimizing the carbon credit market has transformed into a fully operational decentralized carbon credit ecosystem. The DECA roadmap provides insights in different areas and the advances needed to create the DECA Token and the transition to convert it into DECA main.

The DECA roadmap is created in order to provide insights into the history of DECA, since the first meeting to the DECA main creation. As an expert driven project that works closely with its open-source community, the DECA roadmap is meant to be a general guideline. This general guideline will be used in order to transform the DECA ecosystem into one of the largest community driven decentralized carbon credit markets. Please keep in mind that the DECA roadmap that is provided in this whitepaper is subject to change based on priorities, unplanned developments and new ideas.

7. Team & Advisors

The DECA project has been initiated by Innovative Hydrogen Solutions Inc. In order to build the DECA ecosystem, Innovative Hydrogen Solutions Inc. has engaged in a strategic partnership with NeetSec international. Neetsec International consist of various consultants from Canada, Mexico, The Netherlands, Germany and Norway. These talented individuals range from full capacity developers, marketing experts, designers, carbon credit experts to strategy consultants.

The DECA team meets multiple times a week online in order to discuss the advances and possible revisions of the project. These meetings are led by a scrum master in order assure structured meetings which focus on purposeful discussion.

Ronald J. Bogart

CEO of Neetsec International Inc. | Chief Financial Officer of IHS

Ron is the Chief Financial officer of Innovative Hydrogren Solution Inc and has 20 years of experience in the hydrogen-enhanced combustion field. Ron was a former partner of Ernst & Young, a founding member of the Mississauga High Technology Association, and President of IntraLink Associates Limited, a sales organization for clean technology solutions. Ron it's now the president of NSI and he will assist the DECA ecosystem by tracking cash flow and financial planning as well as analyzing the company's financial strengths and weaknesses.

David Pérez Negrón

CTO of Neetsec International Inc.

David is a Communications and Electronics Engineer. He worked in the Experimental Physics area where he developed thermoacoustic engines, open source drivers for multiple measuring tools and numerical analytics tools at CINVESTAV México. He has also worked as a data engineer, architecture designer, and full stack developer for the national electrical market monitoring unit in Mexico, a project developed in collaboration with IPN, SENER, CENACE, and CRE. Currently, he focuses on designing the architecture of the DECA ecosystem, the cybersecurity and the development of smart contracts.

Marco Blanke
CFO of Neetsec International Inc.

Marco, M.A in Business Management with focus on finance, is an experienced consultant in financial and energy markets. He developed successfully hedging strategies for companies in the EU ETS, Carbon Credit and Energy Certificate Markets. Furthermore, he designed financial models and led financial analysis of photovoltaic projects. Currently, Marco is senior financial consultant managing business plans, forecasts, business valuation and market analysis for the DECA ecosystem and several small and midsize companies in Mexico.

Joseph C. Williams
President Innovative Hydrogen Solutions Inc.

Joseph is the president of Innovative Hydrogen Solutions Inc and a partner and strategic advisor of the DECA ecosystem. In addition, he is a two time Manning Award Nominee and holder of multiple Patents related to the IHS technology. Prior to founding IHS, Mr. Williams was involved in a number of companies developing hydrogen technologies, including being President of Globaltech Environmental Products and President/CEO of Canadian Hydrogen Energy Corporation.

Timothy Wardle
Vice President, Operations Innovative Hydrogen Solutions Inc.

Tim is the Vice president of Innovative Hydrogen Solutions Inc and is a strategic advisor of the DECA ecosystem. In addition, he has a broad experienced in telematics, customer satisfaction, procurement, logistics, inventory control and health and safety. In addition, Tim has over 30 years of background experience in emergency and technical operations, service and installation, and hazardous materials.

Stan Gerynowicz
Plant Manager

Stan brings a full range of expertise in the manufacturing process and is responsible for the production process tooling and equipment design. Stan has been trained in the Just-in-Time production process ergonomics and lean manufacturing systems. Stan will assist the DECA team by auditing the teams productivity, quality, and efficiency of operations.

Harold Zibell
VP Business Development

Harold spent his formative years working in Canada's western provinces. He worked as a Sales Rep and Sales Manager. In addition, he went from the #6 seed company in Alberta to #1 in sales volume. As the Senior Vice President of Innovative Hydrogen Solutions he developed sales in the western provinces and the central and western United States. Furthermore, he set up more than 100 dealers in Western Canada. His proven sales record will be utilized in order to establish partnerships and the future growth of the DECA ecosystem.

Arne Lean
Senior Vice President, Engineering

Arne has been the Senior Vice President of Innovative Hydrogen Solutions Inc. since 2010. He has the overall responsibility for the manufacturing process, work instructions and product improvements. Prior to 2010, Arne was the president of Technology TuneUp Inc. for 15 years. In addition to the aforementioned leadership roles, Arne was the Vice President of the Association of Independent Consultants for 10 years. As a strategic advisor, Arne will lead, guide, direct, and evaluate the work of the executive leaders of the DECA ecosystem. This in order to assure a solid strategic direction.

Dr. Emmanuel Noel Moya
Engineer Consultant

Emmanuel provides engineering consulting services to Innovative Hydrogen Solutions Inc. In addition, he has authored several patents and papers on hydrogen on demand and the characteristics of combustion enhancement, including: Improved Combustion in Gasoline/Diesel/Propane fed Internal Combustion Engine using partial Hydrogen from tap water and Nitrogen from Atmospheric Air. Removal of Toxic Gases from Internal Combustion Engine's Exhaust, USA/EPA January 2005. Emmanuel his broad academic knowledge of hazardous materials will be utilized in order to develop the DECA ecosystem.

Manuel Zamora
Senior Economist

Manuel Zamora is a senior economist for the DECA project. He has worked doing economic analysis for the world's largest human resources company, reporting strategic KPIs to the headquarters in the United States and the affiliate companies in Mexico and Central America. In addition, he leads sundry investment projects for SMEs, as well. Currently, Manuel is working in a robust national project developing studies on competition, trading variables and surveillance matters for the energy industry in Mexico.

Osmar Pérez Bautista
Web Developer

Osmar is an experienced digital designer, focused on UI / UX design, web design and illustration. In addition to his skills as a designer, he assists the developer team with the back-end development of the DECA ecosystem.

José Armando Rivera Ramírez
Web Developer

José is a backend developer of the DECA ecosystem. His extensive knowledge in web design and UI / UX is utilized in order to build the current ecosystem.

Óscar Martínez
Web Developer

Oscar is developer on the DECA ecosystem. He focuses in backend applications and blockchain design.

Luis Alberto Saavedra Nieto
CMO of Neetsec International Inc.

Luis is a Mexican Historian and experienced auditor related to private companies and ONG's projects. With eight years of experience in creative directions for marketing companies, Luis now it's responsible for DECA narrative between the scientific language and mass media. Also collaborated with documents general redaction and social media strategies for this economy. In addition, he work with data journalism projects in Mexico.

Azucena Vargas
Graphic designer

She specializes in content creation, brand design and advertising branding.

Paulina Tavera
Communicologist and Graphic designer

Specialist in institutional communication, she collaborated with international organizations and NGOs specialized in energy.
She has extensive knowledge in digital marketing, as well as graphic design and editorial design.

Glossary

Carbon Credits/Carbon Offset

Carbon credits or offsets are the currency (a financial instrument) for emission reduction. They are quantified in metric tons of CO2e reductions made by selected and verified carbon projects. Usually carbon credits are equal to 1 ton of carbon dioxide or equivalent greenhouse gas (GHG). Carbon Credits are determined by jurisdiction, nation or responsible legal entity.[59]

Carbon Footprint

Measurement of the total impact of GHG emissions caused by an organisation. It is expressed in terms of amount of carbon dioxide equivalent.[60]

Carbon tax

This is a form of pricing for carbon gas emissions where a price is fixed by the jurisdictional authority for GHG emissions. Carbon taxes are imposed on companies in order to fight climate change.

Clean Development Mechanism (CDM)

A mechanism under the Kyoto Protocol by which developed countries may finance GHG reductions in developing countries and receive carbon credits for emission reduction.[61]

Greenhouse gases (GHG)

GHG's are gases in the earth's atmosphere responsible for increasing the earth's temperature by absorbing infrared radiation. According to the Kyoto protocol, there are 6 major GHG gases: carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), HFCs (hydrofluorocarbons), PFCs (perfluorocarbons) and sulphur hexafluoride (SF6).[62]

Carbon market

A term for an emission trading system (ETS) through which companies can purchase or sell units of GHG emissions to meet their limit on emissions allowed.[63]

59 Green Investment Services. (2015). Carbon Glossary. 15/04/2019, de Green Investment Services
Web site: http://www.greeninvestmentservices.com/carbon-offsets/carbon-glossary

60 Green Investment Services. (2015). Carbon Glossary. 15/04/2019, de Green Investment Services
Web site: http://www.greeninvestmentservices.com/carbon-offsets/carbon-glossary

61 United Nations. (not defined). Glossary. 15/04/2019, de United Nations
Web site: https://unfccc.int/process-and-meetings/the-convention/glossary-of-climate-change-acronyms-and-terms

62 United Nations. (not defined). Kyoto Protocol - Targets for the first commitment period. 15/04/2019, de United Nations
Web site: https://unfccc.int/process/the-kyoto-protocol

63 United Nations. (not defined). Glossary. 15/04/2019, de United Nations
Web site: https://unfccc.int/process-and-meetings/the-convention/glossary-of-climate-change-acronyms-and-terms

Carbon neutral
An often-voluntary activity which acts as a mechanism to offset carbon emission, in a way that has zero emitting output. Carbon neutrality is achieved by reducing emissions as far as possible, through energy efficiency, and the further acquisition of carbon offsets, in order to have a zero-net emission.[64]

Emission Trading System/Compliance System
A market-based mechanism which sets a cap on emissions desired and let the market determine the price for keeping emissions below the cap. Participants in this market can opt for internal emission reduction measures or acquire allowances.[65]

Kyoto Protocol
An international agreement sharing its aim of stabilizing atmospheric concentration of GHG but requiring separate ratification by governments. The Kyoto Protocol, among other things, sets binding targets for the reduction of greenhouse-gas emissions by industrialised countries. It began ratifying countries in February 2006 and commits developed nations to collectively cut their GHG emissions by 5.2 per cent of 1990 levels by 2008-2012. Renewed and expanded by the Paris agreement.[66]

National Determined Contribution (NDC)
Individual GHG emission mitigation and adaptation contribution agreed by parties to the Paris Agreement.[67]

Paris Agreement
The Paris Agreement replaces the Kyoto protocol and brings global response by making a global agreement to keep the temperature rise below 2 degrees Celsius above pre-industrial levels, by creating new financial mechanisms and technological framework.[68]

Blockchain
A distributed digital ledger in which data is recorded sequentially and permanently in 'blocks'. Each new block is linked to the immediately previous block with a cryptographic signature,

64 Green Investment Services. (2015). Carbon Glossary. 15/04/2019, de Green Investment Services Web site: http://www.greeninvestmentservices.com/carbon-offsets/carbon-glossary

65 Partnership to Market Readiness. (2017). Carbon Tax Guide. 15/04/2019, de Partnership to Market Readiness Web site: https://www.uncclearn.org/sites/default/files/inventory/carbon_tax_guide_-_main_report_web_final.pdf

66 United Nations. (1997). What is the Kyoto Protocol? . 15/04/2019, de United Nations Web site: https://unfccc.int/process-and-meetings/the-kyoto-protocol/what-is-the-kyoto-protocol/what-is-the-kyoto-protocol

67 Partnership to Market Readiness. (2017). Carbon Tax Guide. 15/04/2019, de Partnership to Market Readiness Web site: https://www.uncclearn.org/sites/default/files/inventory/carbon_tax_guide_-_main_report_web_final.pdf

68 United Nations. (not defined). The Paris Agreement. 15/04/2019, de United Nations Web site: https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement

forming a 'chain'. This self-validation of the data protects against tampering as well as allows transactions to be processed and recorded to the chain automatically with no need of a third-party certification agent. The ledger is not hosted in one location or managed by a single owner but is shared and accessed by anyone with the appropriate permissions.

Block
A Package of data containing multiple transactions over a given period. This block records some or all of the most recent data that have not yet entered any prior blocks. Therefore a block could be considered to be like a ledger page or a record book of data.[69]

Chain
The Cryptographic link that keeps blocks together using a 'hash' function. This chain can be considered to be a linked list which contains data.[70]

Hash
The result of applying an algorithmic function to data in order to convert them into a random string of numbers and letters. This acts as a digital fingerprint of that data, allowing it to be locked in place within the blockchain.[71]

Data Mining
The process of solving cryptographic problems using computer hardware to add newly hashed blocks to a public blockchain such as bitcoin. In fulfilling this function, successful data miners keep the blockchain actively recording transactions and, as an incentive, are awarded newly minted bitcoins for their efforts.[72]

69 Lightning Network. (2018). Glossary. 23/04/2019, de Lightning Network Web site: https://lightning.networkhttps//www.google.com/url?q=https://blog.hcitexpert.com/2018/09/glossary-of-terms-and-acronyms-for-blockchain-and-cryptocurrency.html&sa=D&ust=1555437807547000&usg=AFQjCNEx8FsRX49kbLZ6v5I6vqrxiquVkA

70 HCIT Experts. (2019). GLOSSARY OF TERMS AND ACRONYMS FOR #BLOCKCHAIN AND #CRYPTOCURRENCY. 23/04/2019, de HCIT Experts Web site: https://blog.hcitexpert.com/2018/09/glossary-of-terms-and-acronyms-for-blockchain-and-cryptocurrency.html

71 HCIT Experts. (2019). GLOSSARY OF TERMS AND ACRONYMS FOR #BLOCKCHAIN AND #CRYPTOCURRENCY. 23/04/2019, de HCIT Experts Web site: https://blog.hcitexpert.com/2018/09/glossary-of-terms-and-acronyms-for-blockchain-and-cryptocurrency.html

72 HCIT Experts. (2019). GLOSSARY OF TERMS AND ACRONYMS FOR #BLOCKCHAIN AND #CRYPTOCURRENCY. 23/04/2019, de HCIT Experts Web site: https://www.google.com/url?q=https://blog.hcitexpert.com/2018/09/glossary-of-terms-and-acronyms-for-blockchain-and-cryptocurrency.html&sa=D&ust=1555437807549000&usg=AFQjCNFwJ96PpRad0pTJ7DD3kE0DkqX6Yw

Peer to Peer (P2P)

The direct sharing of data between nodes on a network, as opposed to via a central server.[73] In a P2P network the user is considered to be the foundation of the network. Each peer is considered equal. A peer makes a portion of computing resources such as processing power or network bandwidth, directly available to other participants without the need for any central coordination by servers or stable hosts.

Proof of Work (PoW)

Repeatedly running a hash function, the mechanism by which data miners win the right to add blocks to a bitcoin-style blockchain.[74] This algorithm is used to confirm transactions and produce new blocks to the chain. With PoW, miners compete against each other to complete transactions on the network and get rewarded.

Lightning network

The Lightning Network is a "Layer 2" payment protocol that operates on top of a blockchain-based cryptocurrency (like Bitcoin). It enables fast transactions between participating nodes and has been touted as a solution to the Bitcoin scalability problem. It features a peer-to-peer system for making micropayments of cryptocurrency through a network of bidirectional payment channels without delegating custody of funds. Lightning Network implementation also simplifies atomic swaps.[75]

Smart contract

Custom software logic that executes automated events when data is written to the blockchain according to rules specified in the contract.[76] The aim of smart contracts is to provide security that is superior to traditional contract law and to reduce costs associated with contracting.[77]

73 HCIT Experts. (2019). GLOSSARY OF TERMS AND ACRONYMS FOR #BLOCKCHAIN AND #CRYPTOCURRENCY. 23/04/2019, de HCIT Experts Web site: https://www.google.com/url?q=https://blog.hcitexpert.com/2018/09/glossary-of-terms-and-acronyms-for-blockchain-and-cryptocurrency.html&sa=D&ust=1555437807549000&usg=AFQjCNFwJ96PpRad0pTJ7DD3kE0DkqX6Yw

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Token
The means of exchange to give value to a transaction, typically a native cryptocurrency.[78]

Node
Any computer that connects to the Bitcoin network is called a node. Nodes that fully verify all of the rules of Bitcoin are called full nodes. The most popular software implementation of full nodes is called Bitcoin Core.[79]

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