



# Klima DAO: a crypto answer to carbon markets

Michal Jirásek<sup>1</sup>

Received: 3 November 2022 / Accepted: 12 May 2023  
© The Author(s) 2023

## Abstract

Tackling major societal challenges often requires a significant level of organizational novelty. One such recent example is Klima DAO, a decentralized autonomous organization (DAO) that seeks to transform voluntary markets through the adoption of carbon credits. DAOs rely on self-executing rules and have a high level of decentralization. By leveraging blockchain and related technologies, Klima DAO offers innovative solutions to universal problems of organizing in both its governance and product delivery. Blockchain tools enable Klima DAO to operate uniquely, allowing for rapid scaling while maintaining decentralized governance and promoting transparent carbon credit trading with low transaction fees. As such, Klima DAO may serve as a model for future organizations in search of greater transparency and flatter governance structures.

**Keywords** DAO · Decentralized autonomous organization · Carbon credits · Voluntary carbon market · Case study · Organization design

**JEL Classification** H23 · L30 · O35 · Q54

## Introduction

Addressing major societal challenges is a difficult task that demands creative solutions and innovative thinking to fully understand the relevant issues, focus attention on them and orchestrate a long-term impact. Decentralized autonomous organizations (DAOs), which have a novel organizational design that utilizes blockchain technology to enable a high level of decentralization and task automation (Hassan and De Filippi 2021), can provide these benefits. As a result, DAOs have recently become a popular choice for addressing these challenges. However, the question of what it means to organize as a DAO remains.

A particular type of DAOs designed to tackle societal challenges is that of impact DAOs (Owocki and Borda 2022). Examples include Proof of Humanity and GoodDollar, which focus on providing Universal Basic Income, and Gitcoin DAO, which supports digital public goods. Climate change is one of the most pressing challenges addressed by

Impact DAOs, and Klima DAO serves as a notable example in this field. By creating a crypto-based marketplace for carbon credits, Klima DAO concentrates on solving inefficiencies in the voluntary carbon market (KlimaDAO 2022f; TSVCM 2021).

Klima DAO represents a novel form of organizing in its blockchain governance, which differs from that of cryptocurrencies such as Bitcoin (Hsieh et al. 2018), and in its product delivery, which differs from that of traditional players in the carbon market. It is also an intriguing case study due to its challenges, such as the pseudo-anonymity of its leaders and its aggressive initial funding strategy. Despite these challenges, Klima DAO significantly impacted carbon markets within its first year, acquiring carbon credits equivalent to nearly a year's worth of the total emissions of Ethiopia (Climate Watch 2020; Holger 2022). However, its limited transparency has also attracted criticism (e.g., Kessler 2022), and its market valuation decreased sharply (CoinMarketCap 2022).

Klima DAO serves as a model for organizations seeking to make a global and rapid impact. It also illustrates the opportunities and challenges associated with the organizational category of DAOs. Given the limited academic research available on DAOs (Hassan and De Filippi 2021), the case of Klima DAO contributes to our understanding of

---

✉ Michal Jirásek  
mijirasek@mail.muni.cz

<sup>1</sup> Department of Business Management, Faculty of Economics and Administration, Masaryk University, Lipová 41a, Brno 602 00, Czech Republic

DAOs as a distinct organizational form embedded within the crypto world.

## Decentralized autonomous organizations (DAOs)

Klima DAO is a type of decentralized autonomous organization (DAO), an emerging type of organization described as "... a blockchain-based system that enables people to coordinate and govern themselves mediated by a set of self-executing rules deployed on a public blockchain, and whose governance is decentralized (i.e., independent from central control)," (Hassan & De Filippi 2021, p. 2). By the beginning of 2023, there were more than ten thousand DAOs managing assets totaling billions of U.S. dollars (DeepDAO 2023).

From an organizational standpoint, DAOs embody a hybrid and relatively flat organizational structure (Hsieh et al. 2018; Takagi 2017). Although they typically begin as a project initiated by a small group of founders, governance rights are supposed to be distributed among DAO members as the DOA matures (Walden 2020). The governance of DAOs often involves casting votes using tokens (digital assets built on top of blockchain technology; Coinbase 2022).

DAOs possess several governance benefits (Patterson 2021; Wright 2021), including ease of asset allocation, streamlined group decision-making, the increased empowerment and inclusion of regular members, and a transparent and trustless nature. However, DAOs also confront challenges such as member participation (Buterin 2021) and adaptability (Patterson 2021), leaving their potential as yet to be fully realized (Binance Research 2019). For a deeper understanding of DAOs and blockchain governance, see the works of Santana and Albareda (2022) or Lumineau et al. (2021).

## Carbon markets

Greenhouse gas credits, also known as allowances or offsets, are traded in carbon markets. These markets have two forms: compliance and voluntary. Both forms aim to reduce carbon-intensive behavior by accounting for greenhouse gas emissions, but their mechanisms and motivations differ. Compliance markets are established and operate through public policy, with the EU Emission Trading System serving as both a model and as the first large emission trading system (European Commission 2022). The number of countries implementing compliance markets is rising, with 23% of global emissions subject to carbon pricing as of April 2022 (World Bank 2022). In compliance markets, a cap-and-trade

system is commonly used (e.g., in the EU; European Commission 2022). This system utilizes the distribution of tradeable allowances to restrict carbon emissions.

The voluntary carbon market enables actors to go above and beyond regulatory requirements when taking action on climate change (ICROA 2021). In contrast to compliance markets, the voluntary carbon market operates globally and is governed by private sets of standards from institutions such as Verra or Gold Standard. These institutions set the criteria for certifying carbon reduction or removal projects, which can earn carbon credits. For example, a renewable energy project that lacks sufficient financing to establish itself may receive carbon credits if it contributes to the reduction of carbon emissions. Subsequently, these credits can be sold to entities seeking to offset their emissions, thus obtaining additional funding for the project. According to the World Bank (2021), the voluntary market issued carbon credits worth 803 MtCO<sub>2</sub> (million tons of CO<sub>2</sub> equivalent) in 2020, a 30% year-over-year increase primarily driven by demand from corporations. Notwithstanding, the voluntary market remains significantly smaller than the compliance market, with solely China's cap-and-trade scheme covering 4,000 MtCO<sub>2</sub> (World Bank 2021).

The carbon credit lifecycle (Fig. 1), as outlined by Song et al. (2022), comprises six stages and involves significant capital flows to third parties (Paia Consulting 2021):

Stage 1: In this stage, the project developer conducts a feasibility study and selects an accredited standard, under which the project may be eligible for receiving carbon credits.

Stage 2: In this stage, the project must register with the selected standard body (e.g., Verra or Gold Standard).

Stage 3: In this stage, the project's claims are monitored, reported, and verified by the third-party auditors. By this stage, the project must be in operation (e.g., producing renewable energy or reforesting land), so the project developer often seeks funding from investors to finance operations.

Stage 4: Upon verification of claims, the standard body issues corresponding credits and adds them to its private registry.

Stage 5: The credits can be sold, often through carbon exchanges, brokers, or retailers.

Stage 6: The final buyer uses the credits to offset its emissions, resulting in the credits' retirement from the standard body registry.

There are several deficiencies that plague the voluntary carbon market. The Taskforce on Scaling Voluntary Carbon Markets (TSVCM 2021) underscores the fact that the standards for issuing carbon credits vary among different

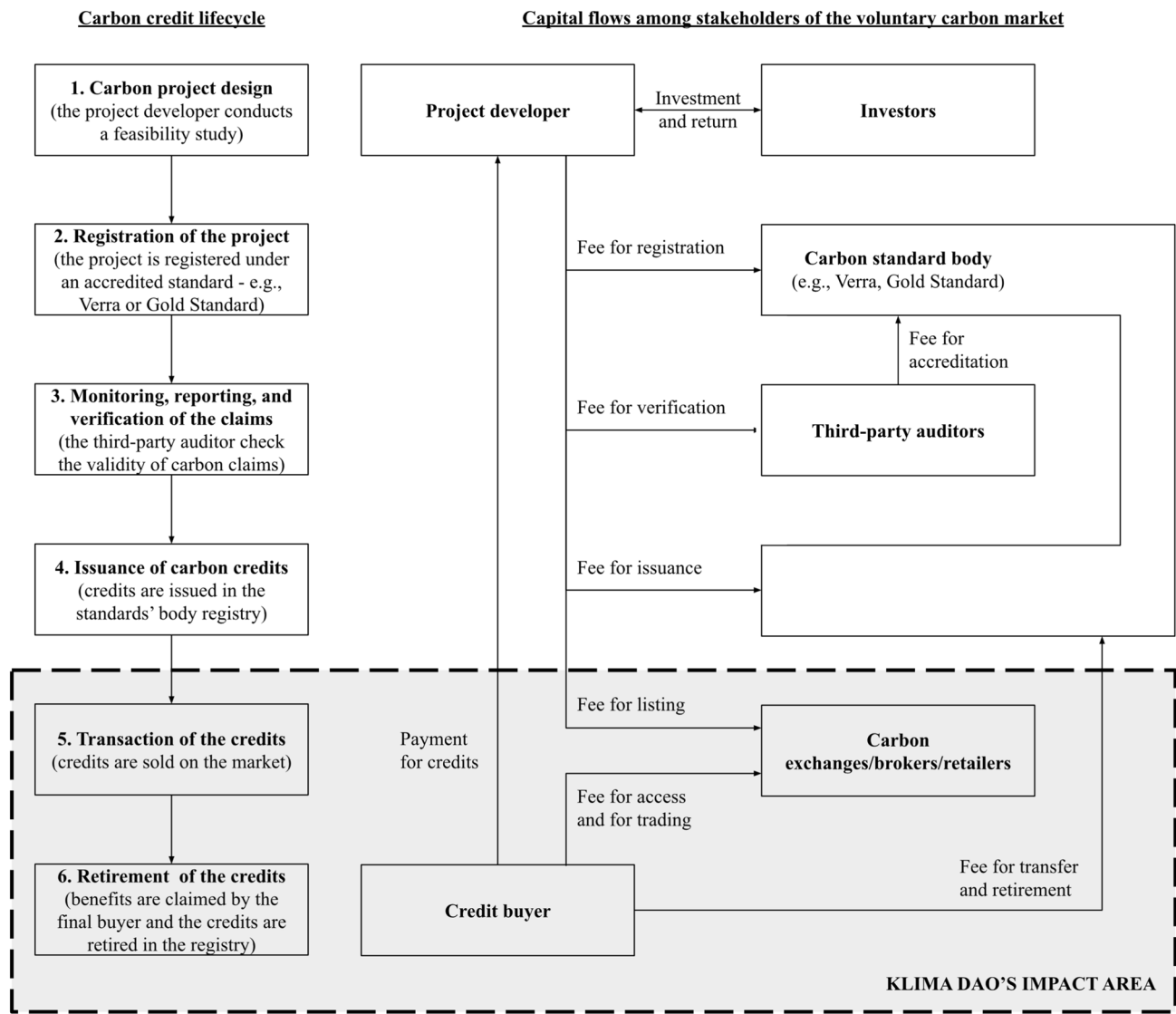


Fig. 1 Credits and capital flows on the voluntary carbon market

standards bodies, which undermines transparency, pricing, and trust in the market. Additionally, the market is mainly accessible only to large actors, while smaller carbon projects and buyers face high barriers to entry given the high fixed costs (Adaime 2022; TSVC 2021). Although carbon credits were one of the first digital assets, they have mostly remained traded face-to-face (Adaime 2022). Given the need for the voluntary carbon market to grow 15 times its 2019 size by 2030 to meet the demands of a 1.5-degree Celsius goal (TSVC 2021), there is a pressing need for changes in the market. This need has led to the formation of Klima DAO, which aims to transform the market (KlimaDAO 2022f).

### Klima DAO in general

The mission of Klima DAO “...is to leverage Web3 [crypto-world] technologies that enable coordination and mass participation within the carbon markets, and fully integrate them into the emerging economic system” (KlimaDAO 2022f). Klima DAO aims to build a blockchain-based trading platform for the voluntary carbon market. The platform’s objective is to enhance the liquidity, accessibility, and transparency of carbon credit trading. The KLIMA token, a crucial aspect of the platform, is designed to serve as a carbon-backed reserve currency (KlimaDAO 2021b).

One of the key benefits of DAOs is their ease of formation. The idea for Klima DAO arose in March 2021 (Archimedes and Oxylus 2021), and within two months, the team published a blog post outlining the initiative (KlimaDAO 2021a). The first round of prelaunch community funding took place in August 2021 (KlimaDAO 2021a), and in October 2021, the protocol was launched, and the KLIMA token became tradable (KlimaDAO 2021c). Within a few days, Klima DAO attracted carbon credits equivalent to over 9.1 MtCO<sub>2e</sub>, surpassing the total annual emissions of Jamaica (KlimaDAO 2021c) and representing more than 1% of all carbon credits issued in 2020 (World Bank 2021). By October 2022, the protocol had accumulated 18 MtCO<sub>2e</sub>, and 70,000 token holders owned KLIMA tokens (Cujowolf 2022). The accumulated carbon credits were equivalent to approximately 4% of all available credits in the voluntary carbon market, positioning the Klima DAO treasury as a potential leading credit holder (Quorum 2022). Figure 2 depicts the change in carbon credits in the Klima DAO's treasury and the number of token holders during the first year of Klima DAO.

The protocol (the set of self-executing rules) behind Klima DAO forms an integral part of the organization. Although a detailed examination of the protocol is beyond the scope of this paper, several key features should be noted. At the center of this protocol is the KLIMA token, which operates on the Polygon blockchain (tied to the widely used Ethereum blockchain). The blockchain immutably records token transactions and ownership, giving KLIMA token holders governance and treasury rights to Klima DAO that are proportional to the number of tokens they possess. Additionally, at least one ton of CO<sub>2e</sub>'s credits backs each KLIMA token. The role of the token is thus quite different from, for example, the tokens of a blockchain protocol (bitcoin in the case of the Bitcoin network,

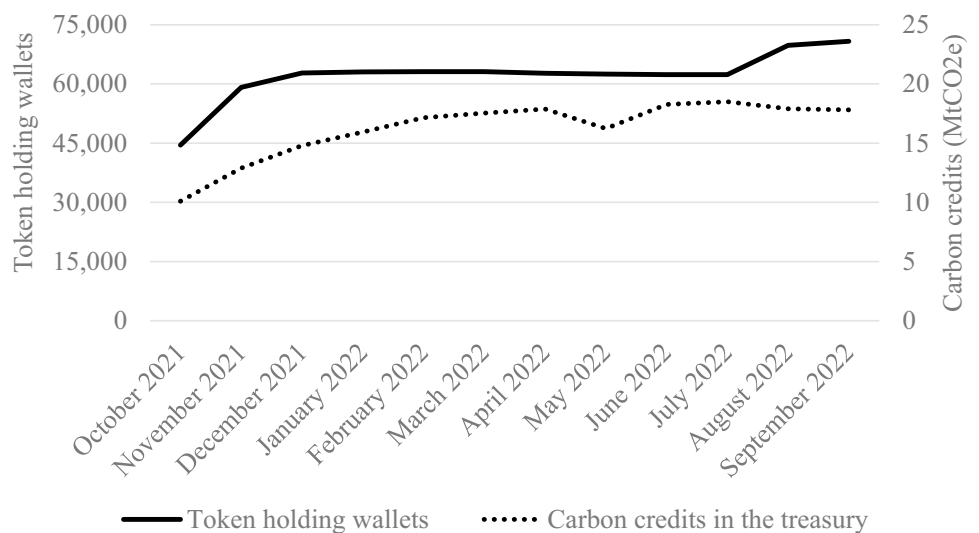
and ether in the case of the Ethereum network, etc.) that are used for paying transaction fees.

The DAO's treasury, which can be thought of as a vault holding all funds collected by the protocol (KlimaDAO 2022j), holds tokens representing carbon credits and U.S. dollars in the form of stablecoins (tokens pegged to the value of the U.S. dollar). As of October 2022, the treasury of Klima DAO had assets worth approximately \$45 million (Cujowolf 2022). Multiple blockchain signatures held by the core team members are used to protect access to the treasury.

There are two primary ways to obtain KLIMA tokens. The first is through bonding carbon credit tokens provided by Klima DAO partners under the protocol of exchanging them for KLIMA tokens. The other is through the purchase and trading of KLIMA tokens on third-party token exchanges, using a variety of other crypto tokens that operate on the Polygon blockchain.

The KLIMA token was designed to be highly inflationary at its inception. The inflation rate decreased over time, but it reached approximately 2,500% in the first year (Cujowolf 2022). This inflation was a primary factor in the decline of the token price from \$1,976 on October 19, 2021, to \$3 on October 19, 2022 (CoinMarketCap 2022), reducing the value of a \$1,000 investment to \$1.5 in a single year. However, the practice of staking rewards earned by depositing (staking) KLIMA tokens in the protocol partially protects long-term token holders. With these rewards, a \$1,000 investment would have been worth \$27 a year later. The traded volume of KLIMA tokens has also decreased along with the price. For instance, during the first month of Klima DAO's existence, daily trading on the Sushiswap crypto exchange was worth \$2–3 million. On the other hand, by the end of Klima DAO's first year, daily trading amounted to only \$60,000 (Sushi 2022).

**Fig. 2** Changes to the number of token holders and carbon credits in the treasury. The horizontal axis denotes the monthly periods within the first year of Klima DAO's operations. Each period commenced on the 18th of a given month and concluded on the 17th of the following month, in accordance with the launch of the protocol on October 18th, 2021



As with Bitcoin (Hsieh et al. 2018), one can examine Klima DAO's organizational novelty (Puranam et al. 2014) from two perspectives: (1) its governance, which relies on blockchain technology, and (2) its "product", trading on the voluntary carbon market.

## Klima DAO and blockchain governance

### Organizational structure

Figure 3 depicts the organizational structure of Klima DAO (Klima DAO 2022e). This structure consists of three layers: (1) the core team of Klima DAO leaders, (2) internal contributors who run the DAO (with functional stewards and the policy team being given additional responsibilities), and (3) KLIMA token holders. In addition to these layers, two other groups of stakeholders intersect with these layers: external contributors, such as third-party contractors hired for specific tasks or bounty hunters who discover bugs in the protocol or work on other bounties, and partners (as discussed later).

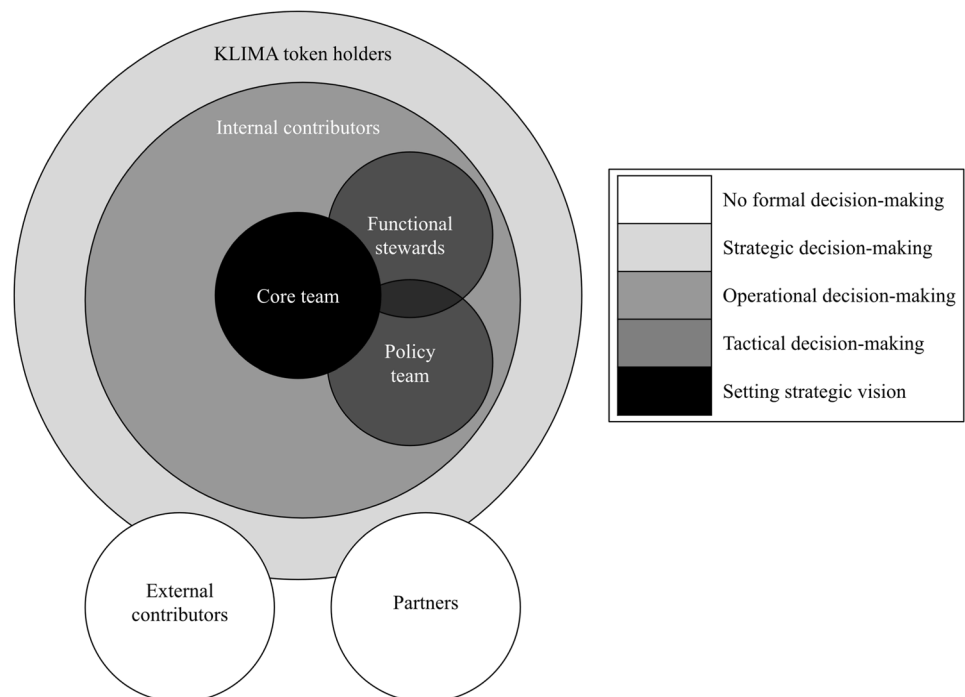
KLIMA token holders make up the only fully open layer in Klima DAO's organizational structure. Anyone can join this group by holding a fraction of a KLIMA token. With this single condition, individuals may take advantage of the pseudo-anonymity offered by blockchain technology and keep their identity hidden, even from the DAO itself (Hsieh et al. 2018). In the case of Klima DAO, this pseudo-anonymity even extends to most core team members.

To become an internal contributor, individuals must participate in a semiformal application process (KlimaDAO 2022d). This procedure was implemented approximately six months after Klima DAO's inception, after a sizable talent pool had been established. Candidates apply by responding to a formal job description and may be sourced either through internal referrals from existing contributors or through an application process initiated on Klima DAO's Discord server. Referred candidates may be invited to commence work immediately, subject to a paid 2–3 week probationary period. On the other hand, non-referred applicants are initially shortlisted based on the qualifications specified in the job description, followed by an interview to evaluate their skills and experience. A designated functional steward oversees and approves the hiring process.

Functional stewards serve as managers and act as intermediaries between the core team and other contributors, help translate the strategy into actionable projects, and ensure that project execution meets budget, time, and quality targets. As of October 2022, internal contributors were divided into seven functional departments: Engineering, Policy and Treasury, Partnerships, Marketing, Operations, Creative, and Community. The Policy and Treasury team is unique among internal contributor groups and is responsible for the economic modeling and monetary policy of Klima DAO, such as determining staking rewards for KLIMA holders. It also provides the DAO with guidance on how to maintain alignment with its mission (KlimaDAO 2022g).

The core team, the innermost layer of the organization, provides strategic leadership by determining the strategic

**Fig. 3** Klima DAO organizational structure and the scope of decision-making





vision and ensuring the alignment of the functional departments with that vision. A portion of the core team controls access to the treasury and protocol code. The core team comprises Klima DAO's co-founders and other individuals who are crucial to the DAO's success. Core team members can only be added or removed with the approval of a majority vote among the existing core team.

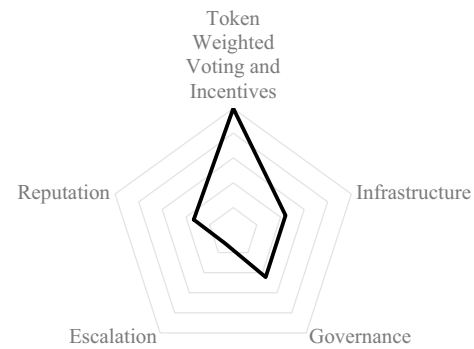
### The core team and anonymity

As of October 2022, Klima DAO had 14 members in its core team, each with specific duties (KlimaDAO 2022a). A noteworthy aspect of the core team is that many members keep their real identities anonymous and are known only by pseudonyms (e.g., Archimedes, Atmosfearful, Cujo, Dionysus, or Oxyoron). However, their anonymity is not absolute due to the transparent nature of blockchains and their participation in various events (thus it is called pseudo-anonymity). Three core team members have publicly revealed their names to the transparent nature of blockchains and their participation in various events (thus it is called pseudo-anonymity). Three core team members have publicly revealed their names to serve as the face of the organization, representing Klima DAO and interacting with the public through events and other opportunities. Additionally, team members frequently reveal their identities during negotiations with partners (Kessler 2022).

The use of pseudonyms by the core team members of Klima DAO, although not uncommon in the crypto world (take Satoshi Nakamoto, the pseudonym of the founder of Bitcoin), is at odds with the organization's goal of increasing transparency in the voluntary carbon market. While Klima DAO utilizes the immutable records of the blockchain and minimizes human intervention through its self-executing rules, the pseudo-anonymity of the majority of its core team members undermines this goal of transparency.

This issue has been brought to the forefront by traditional players in the voluntary carbon market, such as standard organizations (Holger 2022; Kessler 2022). However, the Klima DAO community is not overly concerned with this contradiction. While there are occasional discussions about the pseudo-anonymity of the Klima leaders on internal communication on Discord, most discussants support pseudo-anonymity. They do not see it as a hinderance to the development of a usable product. The anonymous members of the core team seem to view revealing their identities as a distraction from their work (Kessler 2022; Quorum 2022).

The pseudo-anonymity of the leaders of Klima DAO is a source of concern, especially when considering the level of decentralization within the DAO (though the level was already high relative to the state of the industry by the end of 2022). Based on the TIGER assessment of Axelsen et al. (2022) as depicted in Fig. 4, Klima DAO has a high score in the category of "Token Weighted Voting and Incentives," showing good performance in fair token distribution, the low token share of whales (i.e.,



**Fig. 4** TIGER radar graph for Klima DAO. The TIGER radar graph is adapted from the framework for DAO decentralization assessment proposed by Axelsen et al. (2022). This framework evaluates the degree of decentralization across five dimensions (Token Weighted Voting and Incentives, Infrastructure, Governance, Escalation, and Reputation), each encompassing three *subdimensions* (and a recommended indicator). The values presented for each dimension represent the average assessment of the corresponding *subdimensions* (and a recommended indicator) on a scale from 0 to 5, with 0 indicating that the *corresponding aspect of decentralization is entirely unsatisfied*

large token holders), and fairly distributed rewards, and exhibiting no evidence of collusion. However, Klima DAO received low scores in "Infrastructure," "Governance," and "Reputation," with no restrictions on the voting power of whales and low voting participation. The protocol code and treasury access are centralized (though through multiple signatures). Nevertheless, the lengthy governance process through proposals (several stages usually preceding 3-day-long voting) allows dissenting voices to be heard. Additionally, there is no evidence of centralized activity that could hamper the pursuit of further decentralization. The weakest category for Klima DAO is "Escalation," as it lacks a clear constitution or policies for crisis management and because of its democratic control and restricted access to tactical/operational decision-making. On the other hand, Klima DAO's leadership seems receptive to community feedback (e.g., internal community discussion resulted in establishing the Decentralization Working Group described below).

DAOs are often centralized at the beginning of their existence for a good reason (Axelsen et al. 2022; Walden 2020). Nevertheless, there may be some concerns regarding the relatively low level of decentralization, as the core team holds significant control over decision-making. Ownership of the treasury and protocol signing keys grant them considerable power. The fact that most core team members remain anonymous further complicates the issue, making it difficult for other stakeholders to hold them accountable for their actions. Consequently, this structure requires high trust in the core team from the other participants in Klima DAO.

**Table 1.** Protocol update: Bitcoin vs. Klima DAO

Goal	Protocol update	
	Bitcoin	Klima DAO
Task division	Decentralized and transparent through proposals. Voted on by miners based on their computing power.	For major decisions, decentralized and transparent through proposals. Voted on by token holders based on their token stakes. For minor decisions, centralized task division.
Task allocation	Self-selection of developers (based on skills and preferences).	Allocated by formal hierarchies.
Reward distribution	Intrinsic motivation of developers. Voters (miners) are driven by mining profitability.	Contribution-based monetary rewards and/or intrinsic motivation for internal contributors. Voters (token holders) are driven by intrinsic motivation.
Information flows	Transparent and communicated on the code repository.	Crucial information is transparent and communicated through multiple channels; private communication among internal contributors.
Exception management	Designed by a founder, now decentralized (with risks of splits in the community) and relying on a majority vote by miners.	Designed by founders, driven by the core team (while allowing proposals from other stakeholders), transparent, and approved by a vote of token holders.

### Form of organizing: blockchain governance

Initially, Bitcoin was the prime example used to illustrate DAOs in their early days (e.g., Hsieh et al. 2018). However, the crypto-world community (e.g., Aragon 2021; Binance Research 2019) now focuses on the organization element rather than the autonomy element, and blockchain protocols (“cryptocurrencies”) such as Bitcoin are no longer considered DAOs in the strict sense (Hassan and De Filippi 2021). Nevertheless, for both narrowly and broadly defined DAOs, a protocol (a set of self-executing rules) update is a critical organizing process. For example, in Klima DAO, protocol updates included changes to staking rewards and the inclusion of new carbon credit tokens for trading. It is therefore relevant to position Klima DAO as an example of a narrow definition in this regard and Bitcoin as an example of a broader definition. Table 1 compares the two using the framework of Puranam et al. (2014), describing Bitcoin’s organizational form primarily based on the work of Hsieh et al. (2018).

While Klima DAO is an exemplar of a decentralized autonomous organization, it follows a path similar to that of other DAOs by gradually decentralizing its governance, which is sometimes referred to as progressive decentralization (Walden 2020). In its current state, one year after its founding, Klima DAO remains partially centralized, with a critical role being played by the core team holding access to the treasury and the protocol. On the other hand, strategic decision-making was quickly transitioned into a community process (KlimaDAO 2022b). Moving forward, the goal of Klima DAO is to decentralize as much of its governance as possible (KlimaDAO 2022c). It has established the Decentralization Working Group to provide recommendations on the process and address the challenges associated

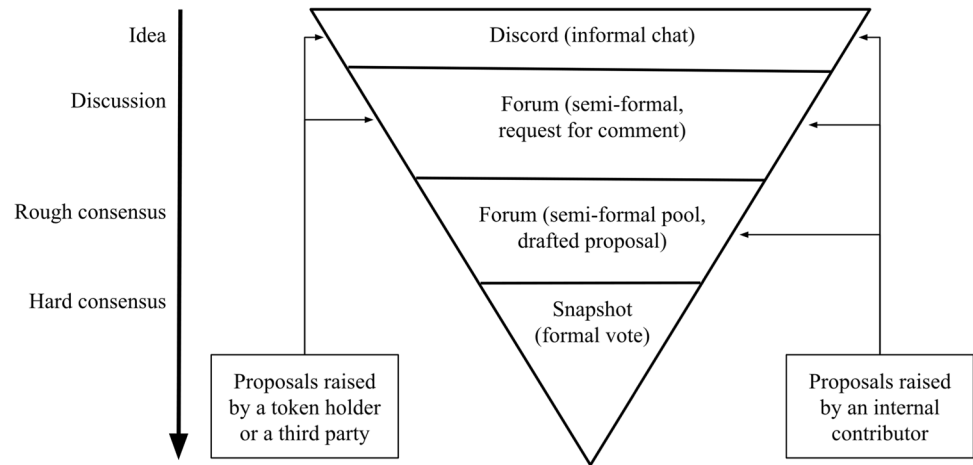
with decentralized governance (e.g., Buterin 2021). Moreover, it has commissioned third parties to assess the state of decentralization.

#### Task division

Task division is different for strategic and tactical/operational levels. On the tactical/operational level, decisions are made within preset limitations (e.g., slightly manipulating staking rewards and pre-negotiating partnerships) by the alignment of the core team and functional stewards using both top-down and bottom-up approaches. At the strategic level, the community casts vote and makes decisions on matters such as changing the decision-making boundaries of contributors or forming partnerships.

The community decision-making process progresses through several stages (as outlined in Fig. 5; KlimaDAO 2022i). First, preliminary proposals for Klima DAO strategic decisions are formed. The proposals come from three potential sources: (1) they are formulated in internal community communication, usually on a Discord server; (2) they come from internal contributors; or (3) they are directly raised by a third party or an individual community member. As the protocol is already running, every proposal implies a change to the current state. The proposals are then posted on a forum for discussion (proposals from internal contributors allow for skipping this step). When the debate is generally positive, an informal poll is conducted to gauge consensus in the community for changing the status quo. If a rough consensus (Bradner 1998) is achieved, a formal off-chain vote among token holders occurs through the Snapshot app. The off-chain vote means that Snapshot uses a blockchain to verify token holders but does not write their vote in it. The vote weight is proportional to the number of tokens held,

**Fig. 5** Klima DAO's governance process



giving major token holders (called “whales” in the crypto world) more influence.

In its first year of operation, Klima DAO saw 30 Snapshot votes (KlimaDAO 2023). Seventy-seven percent of these votes took place in the first six months, and a subsequent decrease that was likely due to seasonal factors (the summer months) and the need to make important strategic changes early in the process occurred. The content of proposals has remained relatively consistent throughout the year, focusing mainly on the integration of the blockchain-based voluntary carbon market, improving the liquidity of the KLIMA token, DAO governance (such as delegating some decisions to internal contributors and setting reward systems), and changes to KLIMA token policies (primarily related to staking rewards).

### Task allocation

Approved proposals and tactical/operational level tasks are executed either by internal contributors (usually for repeated tasks) or external contributors. The tasks are then assigned to a contributor based on individual expertise by a functional steward of a functional team related to the task. Last, changes to the protocol or the treasury are implemented through the signing keys of the core team members.

**Reward Distribution.** Internal contributors receive monthly monetary compensation based on an agreement with the core team, while external contributors are rewarded on an ad hoc basis. Both groups obtain their rewards from the Klima DAO treasury, which was initially funded through a 30% fee applied to bonding carbon credit tokens to the protocol. The treasury continues to receive funds through a small fee (1% or lower, depending on the source) that is levied on the trading and retirement of carbon tokens.

In contrast, core team members are compensated outside of the treasury via options to issue new KLIMA tokens. These options are vested to encourage long-term

commitment from core team members, regardless of the treasury's financial performance.

Compared with the motivations for holding Bitcoin, where financial returns are the primary driver, token holders in Klima DAO support the mission and strive to have a voice in its governance. The high inflation and staking rewards mechanism implemented by Klima DAO indicates a focus on long-term holders.

With the decline in KLIMA trading activity (Sushi 2022), the current holders have either accepted the loss of their investments or have aligned themselves with Klima DAO's current pursuits. The declining interest in voting, which is typical for most DAOs (Buterin 2021), suggests that a significant portion of token holders is passive. Participation in voting decreased from 10% in the first two months to less than 4% by the end of the first year of the Klima DAO (based on the share of tokens held by voters; Cujowolf 2022; Klima DAO 2023). This decline is even more considerable when accounting for the number of voting token holders, which dropped from almost 1,000 in the first months to only 100 at the end of the first year. Similarly, the drop in the price of KLIMA tokens (even when acknowledging its inflation and the broader decline of crypto markets in 2022) discussed above suggests that the value assigned to the token by the community has decreased significantly. Figure 6 illustrates the changes in token price and voting participation over time.

### Information flows

Klima DAO communicates with the public through various channels, such as its website, blog, Twitter, YouTube, and Reddit. The code of the protocol is openly accessible through a GitHub repository. Communication within the organization occurs mainly on a Discord server, which functions like a chat room and provides a platform for community members to discuss various topics. Access to this server is open to anyone who signs up on Discord, rather



than being restricted to token holders. Moreover, weekly calls with core team members are held on Twitter to discuss strategic matters. A separate Discord server with restricted access is reserved for governance purposes.

### Exception management

The structure of Klima DAO was established by its founders, inspired by another DAO, Olympus DAO (KlimaDAO 2022c). The structure remained unchanged during its first year of operation, with only minor adjustments made. Any organizing changes, likely considered strategic, would follow the same process as other formal proposals (see Fig. 5).

## Klima DAO as a carbon market actor

### Form of organizing: a carbon market actor

The previous section mainly reflected the “D” (decentralized) aspect of DAOs. On the other hand, looking at Klima DAO from the perspective of a carbon market actor emphasizes much more the “A” (autonomous) aspect of DAOs, i.e., the use of self-executing roles limiting human intervention (Hassan and De Filippi 2021). Given the depiction of the voluntary carbon market in Fig. 1, Klima DAO aims to improve carbon credit trading (stage 5) and maintain a secondary focus on buyers (stage 6; offering Klima Infinity service that enables on-chain offsetting).

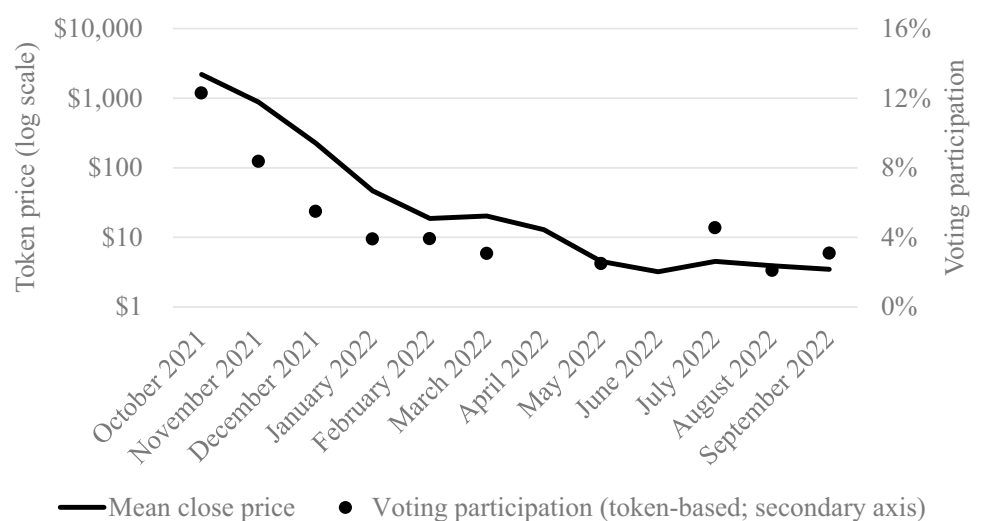
In contrast to Klima DAO, legacy carbon market actors such as brokers, exchanges, and retailers are typically structured similarly to conventional hierarchical private organizations, as described by authors such as Hsieh et al. (2018) and Puranam et al. (2014). These organizations are centralized, rely on hierarchies and formal rules and have limited transparency (see Table 2 for comparison

In contrast, Klima DAO resolves the core problems of organizing (Puranam et al. 2014) to provide carbon credit trading through its protocol (self-executing rules). In this case, the protocol defines the task division and the task allocation (in the other case, these are defined by self-executing rules within or outside the protocol, such as those of Klima DAO’s partners). The protocol also manages reward distribution to third parties or the Klima DAO’s treasury. Self-executing rules run on a publicly accessible blockchain, making reward distribution transparent and auditable by anyone with sufficient technical knowledge. This level of transparency extends to all information flows, including transactions involving Klima DAO, buyers or sellers of carbon credit tokens, and other third parties. All details are available to the respective sides of the transaction.

Exception management is the only aspect of the form of organizing that involves human intervention. The founders established the organizing form, and the core team maintains it (these groups largely overlap). Any significant changes to the protocol are subject to a vote of token holders.

Carbon credit trading on Klima DAO benefits from keeping human intervention to a minimum and limited to exception management. This streamlined process results in faster trading than reliance on traditional carbon market players while enabling lower trading fees. Additionally, the use of blockchain makes trading transparent. Finally, blockchain-based applications such as Klima DAO are highly “composable,” meaning they can be easily integrated into other applications by developers. For example, carbon credit retailers can use the Klima DAO platform to trade or retire credits without obtaining explicit approval from Klima DAO.

**Fig. 6** KLIMA token price and voting participation. The horizontal axis denotes the monthly periods within the first year of Klima DAO’s operations. Each period commenced on the 18th of a given month and concluded on the 17th of the following month, in accordance with the launch of the protocol on October 18th, 2021



**Table 2.** Carbon credit trading: Legacy brokers vs. Klima DAO

Goal	Carbon credit trading	
	A legacy broker	Klima DAO (and partners)
Task division	Centralized task division by job descriptions/definitions, divided by formal organization structure.	Automatically divided by the protocol.
Task allocation	Allocated by formal hierarchies.	Automatically allocated by the protocol.
Reward distribution	Defined by formal compensation/incentive programs. In general, reward schemes are not publicly available.	Automatically distributed by the protocol. Reward schemes are fully transparent.
Information flows	Centrally controlled by a broker, general lack of transparency.	Transparent and partially decentralized. Transaction history is recorded in the blockchain, which is publicly auditable and immutable.
Exception management	Designed by founders, relying on formal hierarchies, a general lack of transparency.	Designed by founders, driven by the core team (while allowing proposals from other stakeholders), transparent, and approved by a vote of token holders.

### Carbon market partners of Klima DAO

Klima DAO has two primary groups of partners. The first group consists of the providers of carbon credit tokens (Toucan, Moss, and C3; KlimaDAO 2022a). These entities bring carbon credits to the Polygon blockchain as tokens, which can then be traded or retired using Klima DAO's platform. Klima DAO streamlines trading with these carbon credit tokens (which differ in their properties, such as the type of project that underlies them). This group of partners has strong ties with Klima DAO. For example, Toucan played a vital role in the launch of Klima DAO by providing the initial carbon credit tokens that were linked to the Klima DAO protocol. In addition, Klima DAO holds a stake in the governance tokens of Moss and C3.

The second group of partners has an interest in offsetting their organizational or individual carbon emissions. For this group, Klima DAO provides Klima Infinity, a toolkit that facilitates the retirement of carbon credits and the verification of offset amounts (KlimaDAO 2022b). A noteworthy user of Klima Infinity is the Polygon blockchain network, where the KLIMA token resides, which retired over 100,000 CO<sub>2</sub>e upon joining (KlimaDAO 2022h).

### Discussion and conclusions

Klima DAO demonstrates the potential of DAOs to introduce novelty in organizing, both in governance and product delivery. However, the question of whether this potential can translate into real-world impact remains. And if it can, then what promises and challenges come with it? In the following sections, I discuss these questions in the contexts of Klima DAO and DAOs in general.

### One-year review of Klima DAO

As Klima DAO celebrated its first anniversary in October of 2022, it is a good time to evaluate its progress in revolutionizing the voluntary carbon market. Klima DAO gained significant attention in its first year, with many carbon market initiatives adopting its blockchain-based platform (e.g., Moss 2021). Additionally, the protocol accumulated an amount of carbon credits in its treasury that is roughly equivalent to the annual emissions of Ethiopia in 2019 (Climate Watch 2020; Cujowolf 2022). The aggressive start of Klima DAO also led standard bodies (such as Verra and Gold Standard) to move forward with adopting blockchain technologies (Quorum 2022). On the other hand, the aggressivity of this start also led to pushback from incumbents, including Verra's withdrawal of support for blockchain-based carbon credit tokens (Verra 2021). Moreover, the KLIMA token faced a dramatic decline in its price (CoinMarketCap 2022), resulting in first-day buyers losing 97% of their investment and a decrease in trading interest (Sushi 2022). In addition, several issues with carbon credit tokens appeared, such as the bonding of controversial carbon credits (Carbon Pulse 2021) and price arbitrage (Toucan 2022), although these events are attributable to the state of the voluntary carbon market rather than to Klima DAO.

Klima DAO manages to balance several inherent issues. The early support by the crypto world, including high-profile endorsements from celebrities and investors such as Mark Cuban (Camilleri 2022), which was undoubtedly fueled by its aggressive staking rewards (Brian 2021), created hype around the protocol. However, staking rewards have been unable to keep pace with numerous headwinds (token inflation, the downtrend of crypto-world investments, etc.). KLIMA token thus did not deliver for many early backers

who were more attracted to realizing extraordinary returns than to alignment with Klima DAO's mission (as evident from, e.g., discussion on the crypto market aggregator CoinMarketCap; CoinMarketCap 2022).

Another inherent issue relates to transparency. The organizational form of DAOs results in additional transparency, which is crucial in building trust within the voluntary carbon market (TSVCM 2021). On the other hand, Klima DAO's core team remains partially anonymous, and the novelty of the token creates legal uncertainty around it (though the DAO obtained a legal opinion on it; KlimaDAO 2022c). The pseudo-anonymity and the KLIMA token likely supported the quick scaling of the protocol. These features do not represent a problem for most of Klima DAO's partners, as they are crypto-native and often resemble Klima DAO. On the other hand, they may create difficulties in interacting with other stakeholders in the voluntary carbon market who reside outside of the crypto world. This group includes standard bodies (e.g., Verra's withdrawal of support; Verra 2021) and large corporate customers who are already engaged in offsetting their emissions.

## DAOs and "Organizing for Good"

The growth of DAOs designed to tackle societal issues, called Impact DAOs (Owocki and Borda 2022), e.g., Proof of Humanity DAO, GoodDollar, or Gitcoin DAO, is a testament to the suitability of DAOs in "Organizing for Good." The DAO organization form comes with a unique set of strengths and weaknesses. The systematic overview of this mix is outside of the scope of this paper, yet an interested reader can find many resources on this topic (e.g., Lumineau et al. 2021; World Economic Forum 2022). First, DAOs are an ideal organizational form for initiatives that aim to scale quickly and globally. Their decentralization and autonomy allow for smooth growth while maintaining a flat structure. Additionally, the governance mechanisms in DAOs allow for many members' transparent, fast, and cost-effective decision-making, which solves some of the problems faced by flat organizations (e.g., Reitzig 2022).

On the other side, DAOs face potential challenges, such as the pseudo-anonymity of members and the unclear legal status of a DAO, that could compromise transparency and trust. These issues can be addressed with some effort, but limited motivation and engagement among DAO members, which could have negative implications (e.g., Buterin 2021), are more challenging to solve. Moreover, the current crypto community is not representative of a global population and still holds to values partially inscribed by Nakamoto (2008) when he introduced Bitcoin, for example, independence and care for public goods. How these conditions might change if a wider population were to adopt the crypto world is hard to estimate.

From the discussion above, we can see that DAOs should have the highest leverage in grand challenges that require global reach and high levels of transparency and trust. Their decentralized nature and reliance on self-executing rules also make them more suited for applications that do not require complex coordination. As evident from the Klima DAO's case, DAOs may be limited in areas where they must interact with stakeholders outside the crypto world. This only adds to the considerable barriers stemming from the use of novel technology (blockchain) that does not fit into numerous processes outside the crypto world.

**Acknowledgements** I want to thank all that contributed to the development of the paper. The paper greatly benefited from the guidance of the Organization Zoo's associate editor Maciej Workiewicz. I am highly thankful for the developmental and inspiring feedback from both anonymous reviewers as well as from the participants of the research seminar of the Department of Organization Studies (Tilburg University). I also want to thank Alex Taylor from Klima DAO for clarification of some information and Mikhail Monashev for his feedback on an early version of the manuscript. The Masaryk University research project MUNI/A/1447/2021 Organizations and challenges of a discontinuous world supported the research, the National Technical Library in Prague supported Open access publishing.

**Author contributions** MJ solely conducted the research and prepared the manuscript. All authors read and approved the final manuscript.

**Funding** Open access publishing supported by the National Technical Library in Prague. The research was supported by the Masaryk University research project MUNI/A/1447/2021 Organizations and challenges of a discontinuous world.

**Data availability** Not applicable.

## Declarations

**Competing interests** I declare no conflict of interest.

**Open Access** This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by/4.0/>.

## References

- Adaime L (2022) 8. Luis Adaime—Founder & CEO of MOSS.Earth. Planet of the Klimate. 8.
- Aragon (2021) How to DAO: Answers for Beginners. Available at: <https://blog.aragon.org/how-to-dao-answers-for-beginners/>. Accessed 17 Jan 2022.

- Archimedes D, Oxylos (2021) Ep 19—27 September—I.O.W with KlimaDAO core team - Archimedes, Dionysus, Oxylos. Agora Podcast - Olympus community podcast.
- Axelsen H, Jensen JR, Ross O (2022) When is a DAO Decentralized? CSIMQ 31:51–75. <https://doi.org/10.7250/csimg.2022-31.04>
- Binance Research (2019) Theory and praxis of DAOs. <https://research.binance.com/en/analysis/dao-theory>. Accessed 3 Jan 2022.
- Bradner SO (1998) IETF Working Group Guidelines and Procedures. RFC 2418, Request for comments. Internet engineering task force. <https://doi.org/10.17487/RFC2418>.
- Brian (2021) KlimaDAO KIP-3 reward rate rationale. <https://www.klimadao.finance/blog/klimadao-kip-3-reward-rate-rationale>. Accessed 12 Feb 2023.
- Buterin V (2021) Moving beyond coin voting governance. <https://vitalik.ca/general/2021/08/16/voting3.html>. Accessed 17 Jan 2022.
- Camilleri M (2022) How billionaire Mark Cuban got revenge on DeFi with KlimaDAO. In: Protos. <https://protos.com/cuban-klimadao-mark-revenge-klima-polygon-bct-toucan-protocol/>. Accessed 12 Oct 2022.
- Carbon Pulse (2021) Crypto carbon demand brings back shunned HFC-23 credits. In: Carbon Pulse. <https://carbon-pulse.com/146462/>. Accessed 27 Feb 2022.
- Climate Watch (2020) Greenhouse Gas (GHG) Emissions. <https://www.climatewatchdata.org/ghg-emissions>. Accessed 12 Oct 2022.
- Coinbase (2022) What is a token? <https://www.coinbase.com/learn/crypto-basics/what-is-a-token>. Accessed 10 Feb 2022.
- CoinMarketCap (2022) KlimaDAO price today, KLIMA to USD live, marketcap and chart. <https://coinmarketcap.com/currencies/klimadao/historical-data/>. Accessed 19 Oct 2022.
- Cujowolf (2022) Klima Main. <https://dune.xyz/Cujowolf/Klima-DAO>. Accessed 12 Oct 2022.
- DeepDAO (2023) DeepDAO. Available at: <https://deepdao.io/organizations>. Accessed 12 Feb 2023.
- European Commission (2022) Development of EU ETS (2005–2020). Available at: [https://ec.europa.eu/clima/eu-action/eu-emissions-trading-system-eu-ets/development-eu-ets-2005-2020\\_en](https://ec.europa.eu/clima/eu-action/eu-emissions-trading-system-eu-ets/development-eu-ets-2005-2020_en). Accessed 1 Feb 2022.
- Hassan S, De Filippi P (2021) Decentralized autonomous organization. *Int Policy Rev* 10(2):1–10. <https://doi.org/10.14763/2021.2.1556>
- Holger D (2022) Cryptocurrency traders move into carbon markets. *Wall Street Journal*, 10 January. <https://www.wsj.com/articles/cryptocurrency-traders-move-into-carbon-markets-11641826402>. Accessed 27 Feb 2022.
- Hsieh Y-Y, Vergne J-P, Anderson P et al (2018) Bitcoin and the rise of decentralized autonomous organizations. *J Organ Des* 7(1):14. <https://doi.org/10.1186/s41469-018-0038-1>
- ICROA (2021) ICROA guidance on corporate climate action. [https://www.icroa.org/\\_files/ugd/653476\\_451f03d2215f445ebc743f4c10c872d3.pdf](https://www.icroa.org/_files/ugd/653476_451f03d2215f445ebc743f4c10c872d3.pdf). Accessed 1 Feb 2022.
- Kessler S (2022) CoinDesk: Bitcoin, Ethereum, Crypto News and Price Data. Available at: <https://www.coindesk.com/layer2/miningweek/2022/03/27/crypto-carbon-can-blockchain-networks-fix-carbon-offsets/>. Accessed 12 Oct 2022.
- KlimaDAO (2021a) Klima DAO fair launch: (Pt 2) liquidity bootstrapping pool. In: Medium. <https://klimadao.medium.com/klima-dao-fair-launch-pt-2-liquidity-bootstrapping-pool-249ebe507555>. Accessed 27 Feb 2022.
- KlimaDAO (2021b) Klima DAO proposal: KIP-3 introduce policy framework. <https://snapshot.org/#/klimadao.eth/proposal/0xbe5ba88701e09fad2548ec2aca539b23cc04a5b7bc1961397fc98a0a303c5249> Accessed 27 Feb 2022.
- KlimaDAO (2021c) KlimaDAO status update. In: Medium. <https://klimadao.medium.com/klimadao-status-update-a29671f90335>. Accessed 27 Feb 2022.
- KlimaDAO (2022a) Core team roles & structure. <https://docs.klimadao.finance/dao/core-team-roles-and-structure> Accessed 12 Oct 2022a.
- KlimaDAO (2022b) Frequently asked questions about klima infinity. <https://www.klimadao.finance/blog/klima-infinity-faqs>. Accessed 9 Sept 2022b.
- KlimaDAO (2022c) Governance Framework. Available at: <https://docs.klimadao.finance/dao/governance-framework>. Accessed 12 Oct 2022c.
- KlimaDAO (2022d) Klima DAO proposal: KIP-19: internal governance model. <https://snapshot.org/#/klimadao.eth/proposal/0x5518f644377aad2bbf2a25296215ad7db257ad983fe67973927daca051213d7b>. Accessed 3 Mar 2023.
- KlimaDAO (2022e) KLIMA token legal qualification. <https://www.klimadao.finance/blog/klima-token-legal-qualification-switzerland>. Accessed 12 Oct 2022e.
- KlimaDAO (2022f) KlimaDAO: An introduction. In: Medium. <https://klimadao.medium.com/klimadao-an-introduction-f55571986c65>. Accessed 1 Feb 2022f.
- KlimaDAO (2022g) KlimaDAO: an introduction to policy making. <https://www.klimadao.finance/blog/introduction-to-klimadao-policy>. Accessed 12 Oct 2022g.
- KlimaDAO (2022h) Organizational structure. <https://docs.klimadao.finance/dao/organizational-structure>. Accessed 12 Oct 2022h.
- KlimaDAO (2022i) The KLIMA token's role in the on-chain carbon market. <https://www.klimadao.finance/blog/what-is-KLIMA-tokens-role-in-onchain-carbon-market>. Accessed 9 Sep 2022i.
- KlimaDAO (2022j) Treasury. <https://docs.klimadao.finance/development/contracts/treasury>. Accessed 12 Oct 2022j.
- KlimaDAO (2023) Klima DAO Proposals. <https://snapshot.org/#/klimadao.eth>. Accessed 9 Feb 2023.
- Lumineau F, Wang W, Schilke O (2021) Blockchain governance—a new way of organizing collaborations? *Org Sci* 32(2):500–521. <https://doi.org/10.1287/orsc.2020.1379>
- Moss (2021) Request for Comment - KLIMA X MOSS collaboration. <https://forum.klimadao.finance/d/5-request-for-comment-klima-x-moss-collaboration>. Accessed 27 Feb 2022.
- Nakamoto S (2008) Bitcoin: a peer-to-peer electronic cash system. *Bitcoin.org*. <https://bitcoin.org/bitcoin.pdf>.
- Owocki K and Borda A (2022) ImpactDAOs. Kewin Owocki.
- Paia Consulting (2021) Carbon offsets and credits, explained. <https://paiaconsulting.com.sg/carbon-offsets-and-credits-explained/>. Accessed 10 Feb 2023.
- Patterson D (2021) Amazing DAOs: decentralized autonomous organizations for beginners: NFT, Metaverse, DEX, Gitcoin, Aragon, Crypto investing, Binance, BNB, BTC, ETH.
- Puranam P, Alexy O, Reitzig M (2014) What's "New" about new forms of organizing? *Acad Manag Rev* 39(2):162–180. <https://doi.org/10.5465/amr.2011.0436>
- Quorum (2022) How DAOs & Blockchain Can Help Solve the Climate Crisis and How You Can Get Involved Today | Marcus Aurelius from KlimaDAO. <https://podcast.quorummedia.xyz/marcus-aurelius/>. Accessed 12 Feb 2023.
- Reitzig M (2022) How to get better at flatter designs: considerations for shaping and leading organizations with less hierarchy. *J Organ Des* 11(1):5–10. <https://doi.org/10.1007/s41469-022-00109-7>
- Santana C, Albareda L (2022) Blockchain and the emergence of Decentralized Autonomous Organizations (DAOs): an integrative model and research agenda. *Technol Forecast Soc Change* 182:121806. <https://doi.org/10.1016/j.techfore.2022.121806>

- Song R, Li A and Ott C (2022) How to build a trusted voluntary carbon market. <https://rmi.org/how-to-build-a-trusted-voluntary-carbon-market/>. Accessed 10 Feb 2023.
- Sushi (2022) USDC-KLIMA—classic pool. <https://www.sushi.com/earn>. Accessed 19 Oct 2022.
- Takagi S (2017) Organizational impact of blockchain through decentralized autonomous organizations. *Int J Econ Policy Stud* 12(1):22–41
- Toucan (2022) A response to our community ahead of NCT launch. <https://blog.toucan.earth/a-response-to-our-community-ahead-of-nct-launch/>. Accessed 27 Feb 2022.
- TSVCM (2021) Final Report. Taskforce on scaling voluntary carbon markets. [https://www.iif.com/Portals/1/Files/TSVCM\\_Report.pdf](https://www.iif.com/Portals/1/Files/TSVCM_Report.pdf). Accessed 10 Feb 2022.
- Verra (2021) Verra statement on crypto market activities. <https://verra.org/statement-on-crypto/>. Accessed 27 Feb 2022.
- Walden J (2020) Progressive decentralization: a playbook for building crypto applications. <https://a16z.com/2020/01/09/progressive-decentralization-crypto-product-management/>. Accessed 27 Dec 2021.
- World Bank (2021) State and Trends of Carbon Pricing 2021. Serial, 25 May. Washington: World Bank. <https://doi.org/10.1596/978-1-4648-1728-1>.
- World Bank (2022) State and trends of carbon pricing 2022. Serial, 24 May. Washington: World Bank. <https://doi.org/10.1596/978-1-4648-1895-0>
- World Economic Forum (2022) Decentralized autonomous organizations: beyond the hype. <https://www.weforum.org/whitepapers/decentralized-autonomous-organizations-beyond-the-hype/>. Accessed 15 Sep 2022.
- Wright A (2021) The rise of decentralized autonomous organizations: opportunities and challenges. *Stanford Journal of Blockchain Law & Policy*. <https://stanford-jblp.pubpub.org/pub/rise-of-daos/release/1>. Accessed 29 Dec 2021.

**Publisher's Note** Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.