

# **BCarbon's Role in the Digital Carbon Ecosystem**

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## **A Working Definition for Carbon Credits**

Carbon credits deliver a medium of exchange for sustainable enterprises. For many providers, one carbon credit stores the value created by removing one metric ton of carbon dioxide from the atmosphere. When properly managed, these credits financially reward good actors who contribute to a thriving, climate-friendly world. By putting a cost on carbon emissions, they encourage heavy emitters to find alternatives and reduce their annual carbon footprint. This aligns incentives as they reduce both costs to the environment and their business.

Carbon markets exist in two capacities: compliance and voluntary. While compliance (mandatory or regulated) markets have formal oversight at the national, regional, or international level, voluntary markets depend upon the willingness of two parties to engage in a carbon reduction of their own volition<sup>5</sup>. Since governments and international organizations have limited resources with which to manage carbon markets, voluntary markets will likely play a key role in achieving the global adoption of sustainable practices that reward both buyers and sellers tangibly.

Farmers have some of the most direct relationships with the environment and arguably have a large potential to capture and store carbon. Some carbon credit issuers focus on industrial carbon capture from the air or the avoidance of certain forms of ecological destruction (ie. forest removal). Others, like BCarbon, focus on nature-based carbon credits. Simple practices such as crop rotation can improve soil health, plot yields, and store more carbon in the ground<sup>6</sup>. In any carbon removal scenario, the issuer facilitates additional financial rewards funded by an environmentally conscious corporation.

## Understanding the Demand

Though farmers will clearly benefit from receiving these assets for their environmentally friendly practices, one might question why any business would place a high enough value on a carbon credit to purchase it willingly. The bureaucracy of governments and international organizations alike has proven consistently to move slowly. While they have and will continue to make important contributions to sustainability, considering the urgent need for change, the involvement of non-state actors has become necessary<sup>8</sup>. Those cognizant of this fact and seeking to stabilize the global ramifications of greenhouse gas emissions would turn to carbon credits for their simplicity, certainty, and amplified impact.

Nature-based carbon credits, in particular, can deliver positive outcomes apart from carbon removal. As mentioned before, BCarbon wants to issue credits for nature-based carbon solutions. One such solution is regenerative ranching, where ranchers move their cattle with the intention to allow for hoove-tilling and manure-fertilizer. This creates valuable co-benefits for the grassland ecosystem<sup>7</sup>. Amongst them are animal welfare and drought/flood resistance. When buyers know that their purchase sets off a chain of environmentally-friendly events, it greatly encourages them to act now.

Furthermore, environmentally aware consumers are on the rise. They demand action from their favorite brands to service the newly mainstream Environmental Social Governance (ESG) guidelines. These ask companies to reinvest some of their profits in community improvement projects that target social or environmental problems. Importantly, no actor has an externally imposed obligation to fulfill this duty. Rather, they commit valuable funds in order to preserve and enhance public perception. A particularly important aspect of that public approval includes

the ability to obtain financing for their operations. This focus on perception is not always the case, especially in the context of high-emission operators. However, those companies engage in mandatory carbon markets to satisfy existing and developing governmental regulations. Then they will, on occasion, purchase further credits in voluntary markets on a similar premise of pleasing climate activists and improving their public image.

### **Carbon as a Liability**

Briefly consider the following: companies purchase carbon credits on a voluntary basis, carbon has no determined price, and spending money elsewhere has significant benefits. If all three of these held true forever, carbon credits might prove a pointless exercise. However, there exists significant evidence against the second point. In other words, carbon is unlikely to remain free for much longer. Any current professional can easily recall the US economic recession during 2008-2009. One significant contributor to this catastrophe was the misuse of a “Value at Risk” metric for the maximum potential downside. Investment banks depended heavily on the veracity of this faulty measurement to their detriment. There is a real, dire parallel between the lack of consideration for factors not included in the financial models then and the widespread indifference to the value of carbon today.

For this reason, smart publicly-traded companies have begun to consider carbon emissions during financial accounting as a liability. If governments embrace climate activism and institute more stringent emission limits, requiring all who emit in excess of mandates to divert spending to offsets, the price of carbon credits will quickly soar. Even before that monumental move, the existence of voluntary carbon markets has slowly built up the value of carbon credits. Some

projects have even made this their primary goal. KlimaDAO does exactly that as a “black hole for carbon” which buys up carbon credits and retires them to bolster its KLIMA token<sup>11</sup>. They purchase a variety of carbon assets from various partners such as Transak, Toucan, and DeltaWave; their selection emphasizes maximization of the overall quantity measured as tons of carbon dioxide “absorbed” or acquired. The resulting upward pressure on price helps reward sustainable projects and creates urgency for emitters to buy carbon credits while they are less expensive.

This supports the notion that companies will soon need to pay off large carbon debts. Harvard Business Review (HBR) describes this risk as “every company [having] an uncovered ‘Carbon Short’ position.” They suggest as a remedy pricing forward emissions and discounting carbon cash flows. One might raise an eyebrow at this use of finance terminology, but carbon has true financial implications with HBR roughly estimating the per tonne value at \$50 today and doubling every two years until 2026<sup>9</sup>. The specifics of what quantity of greenhouse gas emissions each company will need to offset could draw from any regulatory limits, public statements, performance targets, or societal expectations<sup>10</sup>. Industries such as oil, shipping, construction, airlines, and chemicals have followed efficiency standards set by the Environmental Protection Agency to promote air quality since 1975<sup>24</sup>. They will be amongst the first to participate in voluntary carbon markets with their large annual emissions from their business’s core process. These high-emission industries will pay the way towards reducing emissions elsewhere in perpetuity.

For much of the rest of corporate America, the following excerpt from Forbes describes the general emissions breakdown:

“Scope 1 and 2 emissions (referring to a company’s emissions from direct operations and from purchased electricity and power respectively) constitute a tiny portion of their total emissions. The bulk of emissions for non-polluting industries is likely to come from scope 3 (emissions from indirect sources).”

Only 20% of publicly-traded companies report carbon emissions; an even smaller portion makes efforts to offset them<sup>12</sup>. That said, large actors engage in both as a response to the aforementioned societal expectations. As an added benefit, purchasing offsets now rather than later reduces the total cost. In the extreme case, it avoids an abrupt event where suddenly a company cannot break even because of previously overlooked carbon costs.

Presently, the greatest pressure to manage and reduce climate risk has come from investment banks. Public companies issue stock as a means of raising capital and benefit greatly from demand for their stock in the form of increased value and readily available cash. When the financial institutions that manage the majority of that capital withdraw support, it inspires action. Blackrock and others do so to limit the climate risk within their portfolio for which they are held accountable. Also, the inflexible attitude of such a company can predict future issues of not adapting in response to a changing world and limit their future success as a result. Many companies voluntarily disclose carbon emissions to satisfy these powerful financial actors; though, the reporting is not easily comparable or universal. The Securities and Exchange Commission (SEC) has understood this dynamic and now seeks to mandate scope 1 and 2 emission disclosure in a common-structured fashion for registered businesses<sup>13</sup>. Though this proposal will likely see resistance, the SEC expects to ratify the rule in 2022.

## **Traditional Registries**

Verra is without peer in terms of the size of their carbon credit program. They have issued roughly 80% of the verified credits presently in existence worldwide. This sums to 907 million carbon units since their founding in 2007<sup>17</sup>. Verra's multilingual experts fuel their large-scale operations. They have involved themselves in financially rewarding sustainable activities beyond carbon storage, including plastic waste reduction. Their trusted standards align with the United Nations's 1997 Kyoto Protocol, though the high bar to earn credits has serious ramifications. Ranchers wishing to earn carbon credits cannot make significant soil disturbances for up to 100 years, apply with continuing practices, or have profitable enterprises. The Food Agricultural Organization describes "uncontrollable carbon loss" and other forms of soil degradation as consequences of significant soil disturbances from mechanical plowing<sup>18</sup>. As such, they prefer permanent no-till systems which instead engage in direct seeding. Other certifiers feel similarly.

The Gold Standard's philosophy draws heavily from United Nations Sustainable Development Goals (SDGs). They seek to achieve "climate security and sustainable development for all" through verified standards which promote environmental integrity<sup>20</sup>. They emphasize projects that connect multiple goals to provide carbon storage and co-benefits. To qualify for Gold Standard credits, one must submit a detailed project proposal and agree to rigorous third-party monitoring, reporting, and verification procedures. The World Wildlife Fund spearheaded the founding of Gold Standard in 2003 alongside other international Non-Governmental Organizations (NGOs). As a result, servicing an international community is in their DNA.

## Digital Solutions

Popular views of the agricultural community place them off-the-grid, where they manage the farm through ranchhands and paper records. This stems from the rich tradition that started 10,000 years ago with subsistence farming. Farm work was done by hand and with the assistance of livestock such as using an ox to pull a plow. Farming 2.0 started to leverage mechanical devices and benefitted from the worldwide industrial revolution of the 1800s. Then, after the investment in chemical supply chains by the US government to make explosives during World War II, the end of the war left a ripe opportunity. The nitrogen plants started to produce ammonium and the resulting abundance of fertilizer increased US crop yields by one million tons in the four years leading up to 1950<sup>21</sup>. Farming 3.0 represented a time of increased nutrient understanding and chemical availability.

While entering the age of Farming 4.0, farmers cautiously adopt smart devices that leverage information technology and data science to optimize complex farming systems. Fortunately, agriculture has seen outsized benefits from the software, electronics, and sensors geared towards increasing efficiency. In 2015, digital AgTech tools created 30% of the industry's value, which is more than three times the value-add in the automotive industry<sup>14</sup>. As companies like BCarbon seek to bring blockchain technology to ranches, great insights lie in how land stewards have perceived digital tools in other elements of management.

CattleMax has helped ranchers keep track of their herds since 1999. Critically, they provide mobile access to those who seek to edit or view records “at their desk, in the field, or on the go.” While doing so, they need not worry about the destruction or misplacement of records and can rely upon bank-level security against potential data breaches. Another key value proposition



comes from the customer support available and the experienced ranchers that run the company<sup>15</sup>. In the agricultural technology industry, the aforementioned focus on secure and farmer-built products guides the way towards success.

Cross-industry titan Bayer also offers digitalization for their crucial products of seeds and fertilizer. Their FieldView tool takes the hassle out of running experiments to determine which practices result in the highest crop yields. Some of their models even include the ability to recommend alternative seeding practices, nitrogen fertilization rates, and more farming techniques<sup>19</sup>. Other digital solutions focus on having a one-stop-shop for data from satellites, sensors, drones, and other inputs. Once integrated, farmers can comfortably make data-driven decisions that impact crop yield and business outcomes.

### **Other Blockchain Adopters**

Among the other companies aiming to leverage blockchain for carbon credit issuance are Regen Network, Nori, and MintCarbon. Like BCarbon, they recognize the ability of the technology to aid in the verifiability and accountability of carbon credit markets<sup>1</sup>. Some even wish to create a cryptocurrency that tracks the price of one ton of carbon dioxide equivalent. The traditional carbon credit market space still sees little regulation and as a result, has not earned the trust of the public. Without the adoption of blockchain, carbon credit markets would continue to operate on a system of limited accountability with some undeserving projects receiving rewards.

Regen Network has benefitted from first-mover status. Two years after coming together in 2017, the team started the 2019 Techstars Sustainability Accelerator program and has since positioned

themselves as the leaders of blockchain carbon credits. They have focused on developing a frontend user interface that allows any individual to verify the presence of a transaction document on the blockchain without the need for understanding the underlying mechanism. The Regen Ledger used the Cosmos Software Development Kit (SDK) to launch their REGEN token on a Proof of Stake (PoS) blockchain. Thus far, their only credit class is *CarbonPlus* Grasslands with five land stewards having received credits and sold them to Microsoft<sup>2</sup>. The methodology includes the collecting and processing of soil samples, spatial interpolation to map soil organic carbon in unsampled sections, quantifying soil carbon stock, calculating creditable carbon change, and finally assessing the “Plus” co-benefits of ecosystem health and animal welfare.

Another developing registry that hopes to tie its issuances to a token is Nori. The NORI cryptocurrency focuses on providing a market-based reward system for carbon removal, but not the reduction or avoidance of carbon emissions. That said, until the market achieves scale, they have priced their carbon removal tokens at \$15 each. These tokens are intended for immediate retirement without the creation of secondary markets where a buyer of carbon offsets sells to another buyer<sup>23</sup>. The NORI token will launch on the Copper platform, which will support their unique cryptoasset. Another key value proposition by the Nori team lies with their commitment to transparency as they provide credits to farmers tracking increases in soil carbon. They have found success in instituting pre-orders of carbon credits and raising venture capital to propel themselves forward.

MintCarbon, the flagship product of First Carbon Corp, takes a different approach centered around non-fungible tokens (NFTs). One can easily discover, view, and verify these blockchain assets. MintCarbon’s leaders have partnered with the aforementioned traditional registries Verra and Gold Standard<sup>16</sup>. The target customer has already received carbon assets from Verra or Gold

Standard and now seeks liquidity. To provide this, MintCarbon allows recipients to easily create and publish NFTs which represent the underlying carbon asset onto OpenSea, a popular NFT marketplace. Much like other players in the space, one of MintCarbon's primary objectives is to enable efficient credit access on all sides and increase the value of carbon.

### **Data Privacy Considerations**

Agricultural technology (AgTech) creators have struggled for years to avoid upsetting their customers by oversharing data or collecting more than necessary. Though access to this data might improve their product development, farmers care deeply about their privacy given the implications of competitors gaining intimate knowledge of their soil state and cropping practices. Researchers in Australia surveyed farmers and found that more than 60% of farmers mistrusted the data practices of technology providers<sup>3</sup>.

Blockchain has its core function in data storage. It belongs to the category of object stores, with blocks as the primary object. In addition to the protocol-relevant information such as block height and previous hash stored inside the block, metadata can provide context to the transaction. As Regen Network and Nori pilot their first few land developers, they have decided to publicly share information such as a screenshot of the farm's location on a map, names of the landowners involved, methodology, land size, and city-level address. Regen has additionally publicized soil data for some projects, leading some to worry that companies may regularly visit the websites of carbon credit issuers to collect information on their competitors.

BCarbon has collected information on data privacy practices of competitors to display in a table and inform our own decisions.

*Table 1: Data Available Publicly on Other Registries*

Registry	Project ID	Date Issued	Project Name	Project Developer	Project Type	Protocol Used	Credits Issued	Map Location	County	State/Province	Country
<a href="#">Verra</a>	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
<a href="#">The Gold Standard</a>	✓	✓	✓	✓	✓	✓	✓	✓			✓
<a href="#">American Carbon Registry</a>	✓	✓	✓	✓	✓	✓	✓			✓	✓
<a href="#">Climate Action Reserve</a>	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓
<a href="#">Nori</a>		✓	✓	✓	✓	✓	✓			✓	✓
<a href="#">Regen Network</a>		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

The high value of transparency in carbon credit issuance explains the dense matrix above.

Blockchain-enabled carbon credit issuers like BCarbon must carefully plan out which items belong in all-access, limited-access, and no-access storage for display. Our approach seeks to minimize data sharing to that which substantially contributes to the verification of credits. We will leverage pages connected to our blockchain security routes. This will bin the data on our visual interface and make it available to only the appropriate parties. That said, the BCarbon team continues to develop an internal guide regarding what data we place in an all-access bin for the public to view. We already know which elements of the process to show to our buyers and secondary sellers. BCarbon and the applicant will always have access to every associated document for the credit issuance.

Table 2: Availability of Data by Stakeholder Role

<b>BCarbon</b>	<b>Applicant</b>	<b>Buyer</b>	<b>Seller</b>
Application Forms	Application Forms		
Annual Monitoring Data and/or Signed Statements	Annual Monitoring Data and/or Signed Statements		
Contract Closeout Documentation	Contract Closeout Documentation		
Sampling/Stratification Methodology and Maps	Sampling/Stratification Methodology and Maps		
Property Specific Soil Data	Property Specific Soil Data		
Soil Data/ Modeling/Method to Calculate Interim Credits	Soil Data/ Modeling/Method to Calculate Interim Credits		
Deduction Notice or Issuance of additional credit(s) certificates	Deduction Notice or Issuance of additional credit(s) certificates		
Redacted BCarbon Developer Contracts	Redacted BCarbon Developer Contracts		
Redacted Landowner Contracts	Redacted Landowner Contracts		
Project Site(s) Perimeter Maps	Project Site(s) Perimeter Maps	Project Site(s) Perimeter Maps	Project Site(s) Perimeter Maps
Academic Works Cited and Peer-reviewed Literature	Academic Works Cited and Peer-reviewed Literature	Academic Works Cited and Peer-reviewed Literature	Academic Works Cited and Peer-reviewed Literature
Credit Issuance Certificates	Credit Issuance Certificates	Credit Issuance Certificates	Credit Issuance Certificates

## **BCarbon's Distinctive Presence**

We hone in on nature-based carbon sequestration solutions and have scientific rigor as a principal value. BCarbon believes that some stipulations of the Clean Development Mechanism (CDM) from the 1997 Kyoto Protocol hold landowners back from engaging in voluntary carbon markets. Its treatment of additionality, or reductions that would not have occurred in the absence of a carbon market, excludes ranchers that have done the right thing for years. Our carbon credit qualification process focuses on proof of carbon removal without regard for the limitations of additionality. Specifically, we will reward continuing practices, profitable enterprises, and allow subsurface disruptions after 10 years. If you can prove that you are sequestering carbon through regular soil testing, you have a right to sell it. Though they are proponents of additionality, the carbon credit research leaders at CarbonPlan recognize BCarbon as having a top-tier soil carbon standard<sup>22</sup>. We will not issue credits until preliminary soil testing results are collected, and would then conservatively provide interim credits before trueing up the real quantitative increase in soil carbon stocks at five-year intervals. As an added bonus, we support the stacking of benefits such as the sale of hunting rights, protection of environmental species, and carbon storage on the same land.

Our technology-enabled registry comes as the result of collaboration with Houston-based blockchain-as-a-service startup Topl. With us and other clients, they help prove the impact of sustainability projects by leveraging blockchain technology. When we certify carbon removal and find buyers, each buyer receives a non-fungible token (NFT) with information about the issuance including its value in carbon, the ranch it came from, and the date. Cryptographic wallet maintenance will be handled on our site so that users can easily access purchased carbon offsets.

The action of selling these credits or retiring them will appear as a transaction on the Topl blockchain to aid in providing public accountability.

### **Does Blockchain Fit the Use Case?**

Many times, public enthusiasm for a new technology goes beyond its actual capabilities. One technology that embodies that phenomenon is machine learning. Though its predictive power will certainly influence decision-making in hospitals and other businesses, successful players need to have high data availability. Many data scientists whose situations do not match ideal conditions presently face undue pressure from leadership to use machine learning. This draws resources away from other projects for often minimal benefit.

Blockchain has a similar level of public excitement as a result of the wild boom and bust for Bitcoin and other cryptocurrencies. Clearly, it has proven to have the potential to revolutionize finance through decentralization. However, blockchain presents an immense opportunity on its own, completely removed from financial markets. As an immutable, secure, and decentralized information recording system, blockchain keeps a linked sequential list tracking every change to an asset. The supply chain industry benefits greatly from the transparency and verifiability that blockchain technology guarantees. For instance, a timber blockchain could provide an accurate account of the use of sustainably sourced wood in an architectural project. Carbon can fit the supply chain model as landowners source carbon credits with their sustainable practices and then those buying the offsets may choose to sell or retire them.

The obstacles that carbon credit issuers will need to overcome are understanding and coordination. Despite the transparency of block explorers to find and independently verify transactions, few can actually navigate or understand the contents. This problem only worsens when one realizes the minimal overlap between tech experts and the land stewards or buyers that would want to view the blockchain. Furthermore, blockchains can maintain assets with true uniqueness in the form of non-fungible tokens (NFTs). However, as described earlier, multiple organizations seek to leverage blockchain for a carbon credit registry. Although we can ward off duplication in the context of one blockchain, it is much harder to prevent the appearance of copies across different ones. Still, the exciting blockchain technology has attracted some of the best developer talents in the world. It presently functions well and will continue to improve in its mission of better asset management that involves a broader audience. BCarbon has the two key challenges mentioned above at the forefront of our efforts. We seek to boost understandability through the development of an intuitive visual interface as well as effective instructions for the critical feature of viewing the blockchain to verify its accuracy. Given the common goal of various carbon credit issuers to promote sustainability, we have confidence in the future creation of a means to cross-check blockchains for duplication issues. BCarbon stands prepared to intelligently leverage blockchain technology in the impending rush of environmental monitoring and progress to come.



## **Concluding Thoughts**

Through collaborating with farmers to support them in the transition to sustainable agriculture, we can reap the natural benefits of storing atmospheric carbon dioxide in the soil. Tracking this carbon removal allows us to certify and sell it in the form of carbon credits. The businesses that want to cover their outstanding carbon liability of excess emissions would rather pay today's carbon price. Due to international sustainability pressures, the price of carbon is rising and governments may soon mandate a hard limit on emissions. Traditional registries such as Verra and Gold Standard have struggled to maintain a transparent process and have overly stringent eligibility requirements. That said, they have played an important role in establishing the first carbon markets. Other companies have pioneered digital tools for ranchers, finding that data privacy and customer support are of the utmost importance. The benefits of customer support only increase with a team of former and current ranchers to whom the landowner customers can relate. Blockchain registries for carbon credits afford them the necessary transparency and procedures for verification. Though we at BCarbon will always strive for excellence in our soil carbon standard, we also appreciate the presence of other carbon credit issuers like Nori who hope to similarly use blockchain technology. As a group, our contributions to the voluntary carbon market are immense and we continue to build the necessary infrastructure to support a new era of sustainability. Every carbon credit registry, traditional or blockchain-based, plays an important role in reaching its target audience and encouraging the practice which increases soil carbon sequestration on a global scale. Each project continually removing carbon helps to heal our world. We at BCarbon look towards the future not with hope, but instead with confidence as we start to see our climate solution succeed.

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