RaCoTos

Rainforest Proof-Of-Conservation Tokens

Dr. Axel U. J. Lode

Dipl.-Biol. Alexander P. B. Schinko

Arun Jangra

Yogesh Agrawal

Pratham Singhal

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Abstract

The Rainforest Proof-Of-Conservation Token (RaCoTo) project pioneers a novel approach to incentivizing rainforest preservation using blockchain technology. RaCoTos, highly validated tokens equivalent to one ton of carbon dioxide absorbed by the rainforest, deliver transparency, and tamper-proof integrity to carbon offsets. Leveraging real-time satellite data and robust Proof-Of-Ownership verification, RaCoTos aim to disintermediate carbon offset markets and reduce fraud. The resulting data ecosystem, beyond supporting RaCoTos, has potential applications in broader sustainability initiatives and land preservation projects, promising a transformative change in environmental conservation.

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Chapter 1

Introduction

1.1 Regenerative Finance: Good Ideas, But Little Data

Regenerative finance represents a paradigm shift in our economic systems, promoting the idea that economic growth and environmental preservation can, and should, go hand in hand. By marrying finance with ecology, it seeks to move us away from extractive and exploitative models of economic development and towards a more sustainable and holistic approach.

Despite its transformative potential, the real-world implementation of regenerative finance has been fraught with challenges. Key among these is the issue of data security and validity. For a regenerative finance project to work, it needs reliable, real-time data on the ecosystems it is targeting. However, gathering and verifying this data in a secure and trustworthy manner has proven to be a complex task.

This is where blockchain technology comes into play. Blockchain, with its decentralized and immutable nature, brings a unique set of security and validity guarantees to the table. It ensures that once data is recorded onto a blockchain, it cannot be tampered with or falsified. This makes it an ideal technology for implementing regenerative finance projects, as it can provide a secure and verifiable record of conservation efforts.

However, the efficacy of blockchain is jeopardized when smart contracts are created that rely on off-chain data, which is not as secure and valid as the blockchain in use. Since off-chain data sources do not inherit the security guarantees of the blockchain, they can become weak links in the system, susceptible to manipulation and fraud.

Unfortunately, almost all the regenerative finance projects in existence to date are using such non-validated, off-chain data. This introduces a degree of trust into the system, as users must trust that the off-chain data being used is accurate and has not been tampered with. This trust-based model is a far cry from the trustless nature of blockchain technology and undermines the security and validity guarantees that blockchain brings to the table.

The Rainforest Proof-Of-Conservation Token project aims to address this shortcoming by leveraging secure, real-time data from oracles in the Chainlink network, ensuring that the data used for our tokens is as secure and valid as the blockchain itself.

1.2 Rainforest: Green Lungs and Host to Biodiversity

Rainforests, often referred to as the "green lungs" of our planet, play a pivotal role in maintaining global climate and supporting an astonishingly diverse array of life forms. They act as natural carbon sinks, absorbing vast amounts of carbon dioxide - a key greenhouse gas - and converting it into oxygen, playing a crucial part in the Earth's carbon cycle.

Scientists estimate that a significant portion of the world's biodiversity is housed within these rainforests - in fact, some estimates suggest that up to 80% of terrestrial biodiversity is found in rainforests. They are a veritable treasure trove of life, with many species yet undiscovered. This astonishing level of biodiversity is not just an indicator of a healthy ecosystem; it's fundamental to life on Earth. Biodiversity aids in maintaining the overall health and equilibrium of the ecosystem, as every species, no matter how small, plays a role in this complex web of life.

However, despite their inestimable value, rainforests are under severe threat due to rampant deforestation and degradation, primarily driven by human activities. This loss of rainforests not only results in a significant reduction of the Earth's capacity to absorb carbon dioxide but also leads to a catastrophic loss of biodiversity.

The amount of carbon dioxide absorbed by a rainforest per square kilometer is on the order of hundreds of tons per year. This staggering capacity to offset carbon emissions, if provably traceable by data, represents a significant asset. When this asset is made tradeable, such as through tokenization in the form of Rainforest Proof-Of-Conservation Tokens (RaCoTos), it provides a powerful economic incentive for conservation efforts.

By tokenizing the carbon offset capacity of rainforests, RaCoTos effectively convert the carbon absorption capacity of a specific area of rainforest into a tradeable asset, thereby providing a direct, tangible economic value to conservation efforts. This not only incentivizes the preservation of existing rainforests but also encourages the restoration of degraded areas, thus contributing to the fight against climate change and biodiversity loss.

1.3 Why Rainforest Proof-Of-Conservation Tokens?

In response to the challenges faced by regenerative finance projects and the urgent need for effective solutions for rainforest conservation, the Rainforest Proof-Of-Conservation Token (RaCoTo) project was conceived. RaCoTos represent a novel approach in the world of carbon offset and regenerative finance, as they aim to deliver a trustless system underpinned by secured data from the decentralized Chainlink network.

Each RaCoTo is designed to be a highly validated and verifiable equivalent to one ton of absorbed carbon dioxide. This design is crucial in ensuring the integrity and reliability of the tokens. It ensures that every token issued corresponds to a tangible, quantifiable conservation effort, thereby providing a direct link between the tokens and the real-world impact they represent.

What truly sets RaCoTos apart, however, is the trustless validity they bring to the field of carbon offsets. Traditionally, carbon offset projects and companies have been fraught with issues of fraud and manipulation. These projects often lack transparency, making it difficult to verify the validity of the offsets they claim to produce. This has led to skepticism and has undermined the credibility of carbon offsets as a solution for climate change.

RaCoTos address these issues head-on by leveraging the power of blockchain technology and the Chainlink network. The use of blockchain ensures that the process is disintermediated and tamper-

proof, while the Chainlink network provides secure, real-time data for the tokens. This combination delivers an unprecedented level of transparency and integrity to the carbon offset field.

By tokenizing the carbon absorption capacity of rainforests, RaCoTos provide a powerful economic incentive for conservation efforts. They convert the invaluable service provided by rainforests into a tradeable asset, thereby creating a market-driven solution to rainforest conservation. This approach not only incentivizes the preservation of existing rainforests but also encourages the restoration of degraded areas, contributing to the fight against climate change and biodiversity loss.

Chapter 2

Rainforest Proof-Of-Conservation Tokens

2.1 Proof-Of-Conservation

A fundamental aspect of the Rainforest Proof-Of-Conservation Token project is the establishment of a robust and verifiable proof of preservation. This is facilitated by harnessing real-time satellite imagery, procured from state-of-the-art Earth observation satellites such as Sentinel, Landsat, and IceEye. The data acquired from these satellites is protected and authenticated using Chainlink Functions technology, assuring its trustworthiness, immunity to tampering, and timeliness, Fig. 2.1.

These satellites, with their sophisticated sensing capabilities, offer a trove of high-resolution data about our planet's rainforests. The Sentinel satellites, part of the European Union's Copernicus Programme, the Landsat series operated by NASA and USGS, and the IceEye's Synthetic-aperture radar (SAR) satellites, provide consistent and detailed monitoring of the Earth's surface. They collectively generate a continuous stream of data, publicly accessible and invaluable for monitoring various environmental parameters.

For the RaCoTo project, we analyze this data in conjunction with other resources like Global-
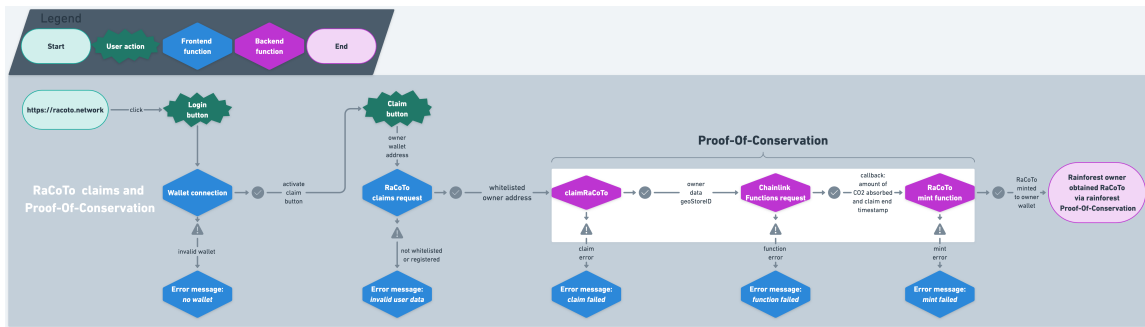

Figure 2.1: Flowchart of the Proof-Of-Conservation process verifying the forest cover and carbon absorption.

ForestWatch and SentinelHub to detect deforestation events and calculate carbon dioxide net flux with high spatial accuracy. The high spatial resolution of these satellites enables the detection of small-scale changes in forest cover, thereby allowing for early identification of deforestation events. The measurement of carbon dioxide net flux offers an accurate estimate of the amount of carbon dioxide being absorbed by a specific area of the rainforest.

This amalgamation of real-time, high-resolution data forms the cornerstone of RaCoTo's proof of conservation. It ensures that each token corresponds to a quantifiable and verifiable conservation effort, enhancing the tokens' credibility and providing token holders with a clear and reliable record of their investment's impact. Leveraging Chainlink Functions technology to secure this data ensures that the proof of conservation aligns with the security and validity inherent in blockchain, delivering a truly trustless system for rainforest conservation.

2.2   Proof of Ownership

An equally critical component of the Rainforest Proof-Of-Conservation Token project is the establishment of a reliable proof of ownership. This proof is derived from the certificate of ownership issued to the rainforest owner, which is stored immutably and subjected to a tamper-proof validation process.

The process begins with the acquisition of the certificate of ownership, Fig. 2.2. This certificate is issued by a recognized authority such as a state, province, or municipality, and it confirms the ownership of a specific area of rainforest. This certificate is then stored on the blockchain via the Interplanetary File System (IPFS), a protocol designed for the decentralized storage and sharing of immutable data. This ensures that the proof of ownership is both secure and tamper-proof.

To further enhance the validity of the proof of ownership, regular verifications are performed with the issuer of the certificate. These verifications serve as an additional layer of security, ensuring that the registered owner of the rainforest remains the same and that the certificate of ownership is still valid, see Fig. 2.3.

Moreover, a regular vetting investigation ensures that the registered patch of land has not been used for other carbon dioxide offset tracking protocols or projects. This is crucial to avoid double-counting of carbon offsets, which could undermine the integrity of the accurate correspondence of Rainforest Proof-Of-Conservation Tokens to carbon dioxide bound by the tracked rainforest.

The result of the data-driven Proof-Of-Ownership verification processes is documented and stored immutably on the blockchain. This not only provides a transparent and verifiable record of the ownership of the rainforest but also ensures that the process is tamper-proof. The Proof-Of-Ownership process aims to comply with all decentralization and security requirements of blockchain technology in an effort to add an unseen level of integrity and validity to the verification of rainforest conservation.
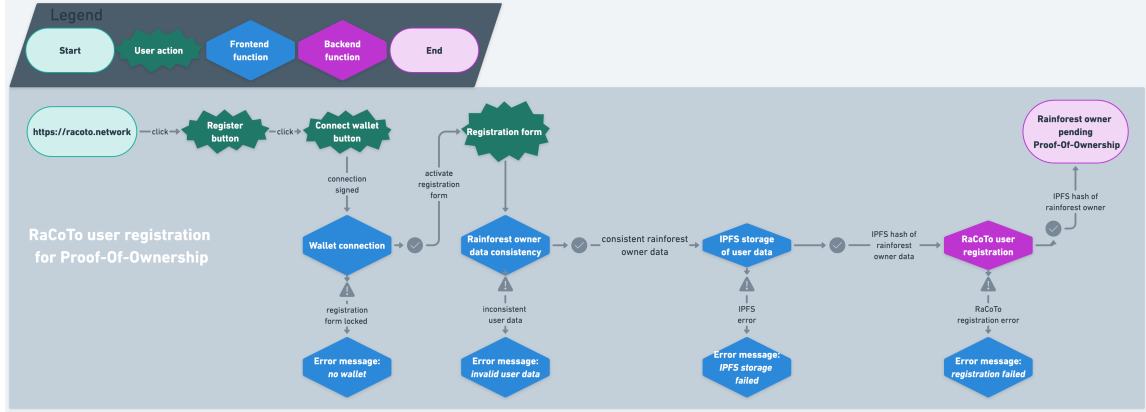
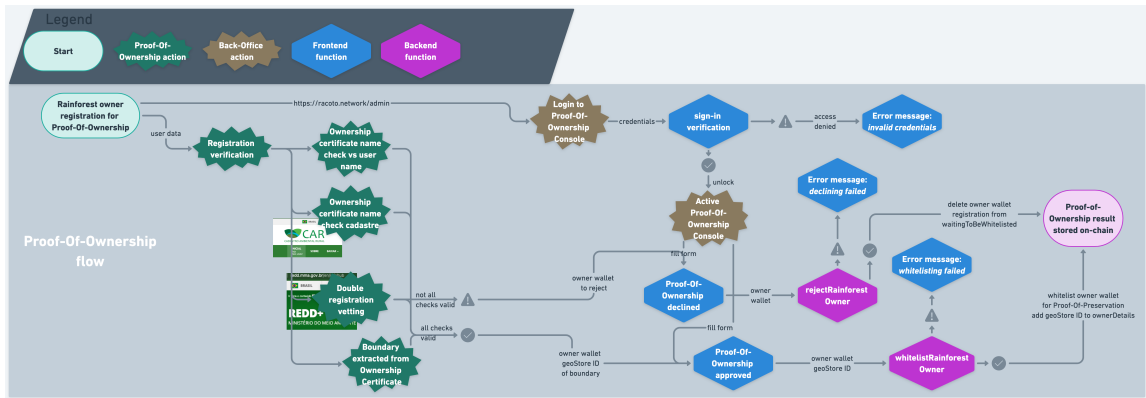Figure 2.2: Flowchart of rainforest owner registration with ownership certificate.

Figure 2.3: Flowchart of the Proof-Of-Ownership verification process.

2.3   Tokenomics

The tokenomics of Rainforest Proof-Of-Conservation Tokens (RaCoTos) are structured to incentivize and reward the preservation of rainforests while ensuring transparency and accountability. Here are some key aspects of the tokenomics model:

- **Carbon Offset Representation:** Each RaCoTo is designed to represent exactly one ton of net absorbed carbon dioxide, providing a direct, quantifiable measure of conservation effort.

- **Data-driven token creation:** RaCoTos are created as the result of a decentralized data validation process that tracks carbon dioxide savings with satellite images close to real-time.

- **Retirement Mechanism:** RaCoTos can be retired irrevocably and transparently via a blockchain transaction. This retirement transaction serves as a proof of compensated carbon dioxide emissions, adding another layer of accountability and transparency to the system.

- **Token Distribution:** The rainforest owner receives 99% (0.99 fraction) of the created RaCoTos. This significant share rewards owners for their conservation efforts and incentivizes them to continue preserving the rainforest.

- **Project Treasury:** A small fraction (0.01), 1% of the emitted RaCoTos, is directed to the RaCoTo project's treasury. This is used to cover development and verification expenses, ensuring the project's sustainable operation.

- **Project Commitment:** The RaCoTo project commits to not accumulate RaCoTo. Any surplus of RaCoTo in the treasury is either retired or used to provide liquidity for enabling the exchange of RaCoTo for other assets, ensuring the value of the token for rainforest owners.

- **Market Value:** With carbon dioxide currently traded at about USD 50 per ton, the earning potential for preserving a square kilometer of rainforest, which binds hundreds of tons of carbon dioxide per year, is substantial. This can amount to thousands of USD per square kilometer per year.

- **Earning Potential:** The earning potential from preserving the rainforest and earning RaCoTos outweighs incentives for repurposing the rainforest for other uses like mining, farming, or livestock.

- **Future Value:** As awareness of climate change increases and efforts to combat it intensify, the value of carbon dioxide offsets, and consequently, RaCoTos are expected to grow exponentially.

Through this innovative data-backed tokenomics model, RaCoTos aim to harness market forces to incentivize rainforest conservation, ensuring that preserving these crucial ecosystems is not just ecologically responsible, but also economically advantageous.

Chapter 3

Roadmap

3.1 Data Sources

The Rainforest Proof-Of-Conservation Token project is committed to leveraging the most reliable, independent, and diverse data sources to ensure the integrity of the Proof-Of-Conservation and Proof-Of-Ownership validation processes. At present, these processes employ a combination of automation and human-based vetting, but the roadmap aims to achieve full automation and disintermediation.

3.1.1 Proof-of-Conservation Data Sources

Our Proof-Of-Conservation process primarily uses data derived from Global Forest Watch, a public and independent provider of satellite image analyses. This data is secured through Chainlink Functions, a trustless protocol that ensures the validity and reliability of the data.

In line with our commitment to diversifying our data sources, we are planning to integrate additional data from SentinelHub and ICE EYE, renowned providers of global satellite imagery. Furthermore, we are looking forward to collaborations with drone-footage verification services to further strengthen our data validity. This will add redundancy and further improve the reliability of our Proof-Of-Conservation process.

As part of our roadmap, these enhanced data sources will be integrated using Chainlink Functions or in the form of a decentralized oracle network. This will further ensure the trustless and disintermediated nature of our data sourcing.

3.1.2 Proof-Of-Ownership Data Sources

Currently, our Proof-Of-Ownership process involves a human-based vetting and verification of the certificate of ownership and the non-duplicate usage of the rainforest for the generation of carbon dioxide offsets. The data gathered in this process is stored in an immutable and tamper-proof manner, ensuring its validity.

However, our roadmap aims for this process to become fully data-driven, automated, and disintermediated. This will involve leveraging public information systems, such as the digital land ownership registry of Brazil or carbon dioxide offset project databases. We also plan to engage legal advisory or consulting services to ensure the accuracy and legality of the ownership data.

By continuously improving and diversifying our data sources, the Rainforest Proof-Of-Conservation Token project is committed to ensuring the integrity and reliability of our tokenomics, and ultimately, our contribution to the preservation of the world's rainforests.

3.2   Bootstrapping a Data Ecosystem

The data ecosystem generated by the Rainforest Proof-Of-Conservation Token project is not just integral to the operation of RaCoTos, it also has the potential to contribute significantly to broader sustainability efforts. By facilitating the alignment of incentives for ecosystem preservation and sustainability tracking, the data ecosystem nurtured by the RaCoTo project has far-reaching implications beyond the project itself.

A key aim of the RaCoTo project is to standardize and openly share this valuable data. Standardization ensures that data is consistent, comparable, and usable across different platforms and initiatives. It also facilitates the integration of this data with other datasets, further enriching its potential for analysis and application.

Moreover, by openly sharing this data, we aim to make it accessible to a wide range of stakeholders. This includes other environmental projects, researchers, policy makers, and the public. In doing so, we hope to contribute to a more informed and effective global response to environmental challenges.

As part of our commitment to data sharing, we are exploring collaborations with initiatives like dClimate. This platform focuses on democratizing climate data and making it accessible to a wider audience. By contributing our data to platforms like dClimate, we aim to support the development of a rich, shared resource of climate and environmental data.

Through these efforts, the RaCoTo project is not only working to conserve rainforests and combat climate change, but also to build a robust, open data ecosystem that can empower a wide range of sustainability initiatives and research.

Chapter 4

Conclusion

Conclusion and Outlook This light paper has introduced the Rainforest Proof-Of-Conservation Token (RaCoTo) project, an initiative that leverages blockchain technology and the power of data to promote and incentivize rainforest preservation. Central to this project are the Rainforest Proof-Of-Conservation Tokens, which represent verifiable, trustless equivalents to one ton of carbon dioxide absorbed by the rainforest. Through the use of decentralized Chainlink network oracles and secured data from multiple sources, RaCoTos aim to provide a highly validated, transparent, and fraud-resistant solution in the field of carbon offsets.

The RaCoTo project utilizes two fundamental processes: Proof-Of-Conservation and Proof-Of-Ownership. The former, powered by real-time satellite imagery from providers like Global Forest Watch, SentinelHub, and ICE EYE, verifies the conservation and carbon absorption of designated rainforest regions. The latter, meanwhile, ensures the legitimacy of rainforest ownership through rigorous vetting and verification, leveraging public information systems and legal advisory services.

The resulting data ecosystem not only supports the RaCoTo project, but also has the potential to empower other sustainability initiatives. Our goal is to standardize this valuable data and share it openly, thereby contributing to a more informed and effective global response to environmental challenges.

Looking forward, the methodologies developed for the RaCoTo project, particularly the Proof-Of-Conservation and Proof-Of-Ownership processes, could be applied to other preservation initiatives. For instance, these processes could help incentivize landowners to preserve areas of high biodiversity, or protect endangered species habitats. These additional applications underscore the broad potential of the RaCoTo project to drive transformative change in environmental conservation.

In conclusion, the Rainforest Proof-Of-Conservation Token project is not only an innovative response to the urgent need for rainforest conservation and carbon offsetting, but also a pioneering initiative in the broader field of environmental sustainability. Through the application of advanced technology and data, we aim to inspire and empower a new era of sustainable, data-driven environmental stewardship.