OPEN FOREST PROTOCOL

WHITEPAPER

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OFP

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Introduction and Scope of Problem

With temperatures predicted to increase [by at least 1.5 degrees Celsius](#) above pre-industrial levels, the current global climate crisis has the future of life on earth changing on an unsustainable trajectory. Not only does such a climate threaten biodiversity and wildlife in all parts of the globe, but it also promises to drastically challenge human-made systems and existing infrastructure that hundreds of millions of people depend upon.

One generally accepted solution towards preventing an unlivable or altered climate is to sustainably plant, regenerate and conserve forests on large swaths of land to create carbon sinks for drawing down CO_2. To date, forestation remains a prime nature-based solution with a considerable number of co-benefits such as support for biodiversity and watershed protection. Reaching the proper scale however, faces some key barriers and challenges. These challenges include:

1. A Lack of Accurate Measurement, Reporting, and Verification (MRV) of Forest Data: Organizations and governments alike remain hesitant to commit to funding forestation projects without a clear mechanism by which projects success can be verified. With no coordination between projects, each initiative makes due with the best verification tools it possesses. Not only are projects difficult to consistently scale because of this problem, but there is no quantifiable means of knowing how successful previous projects have been in reducing emissions or planting trees due to a lack of consistent MRV standards. For the few certifications that do exist (1) many projects do not have the resources to implement or comply with them, while (2) there is no common consensus on one unique label, and (3) even a label does not guarantee complete transparency over time.

2. Data Accuracy and Precision: Due to the numerous methods of measuring, verifying and reporting the status of a project, the data that is collected is either manually recorded using paper-based records (and thus is at a risk of being misplaced, illegible or incomplete), or remotely verified using satellite imagery (but lacking in ground level precision). As such, gaps of information for any given forestation project exist, and can vary significantly according to the precision, magnitude, and quality of data collected. Without a structure from which projects can be geographically and qualitatively standardized, the legitimacy of the forestation effort, as well as any resultant data from a project is siloed and left to stand on its own.

3. Project Funding and Local Inclusion: Legitimacy in particular forestation efforts is defined by the capacity to afford MRV tools and financial support from reputable backers. In a symbiotic relationship, those who can afford to prove the veracity of their project, are also those who have the opportunity to raise funds for their project, at scale. Meanwhile, projects that cannot guarantee measurement, reporting, and verification that trees have actually been planted and are absorbing carbon, have more difficulties convincing funders to put forward capital. The end result is that marginalized communities that lack sufficient financial and social capital to access these markets are left out of the forestation economy. Potential funders, likewise, have a difficult time connecting with land stewards in these types of communities, missing opportunities to fund potential projects. Ensuring more equitable access to MRV tools and carbon markets also means that local communities will be more deeply involved in managing forests. Currently, many projects are verified by independent verifiers who infrequently monitor forests to which they have little or no connection.

4. Collaborative Funding Mechanisms: To date, due to limited oversight and monitoring, it is difficult to collaboratively fund a forestation project. Most frequently, funding is expected to be linked to one source, so as to avoid double counting from different organizations and to ensure accountability for the allocation of all funds. As a result capital allocation for forestation projects is 'siloed' and project funding from multiple funders remains limited.

5. A Lack of Standardization For Carbon Credits: Carbon markets remain fragmented, illiquid, and prone to problems of double spending and price volatility. Different standards for what constitutes a carbon credit, and where that credit has come from has made it difficult to create a standard carbon credit marketplace across existing markets. Carbon markets are growing significantly as the human community addresses the climate crisis.

In response to these five challenges, this document puts forward a blueprint for a comprehensive solution for digitizing forestation and nature-based carbon removal measurement, reporting, and verification processes in a trustless manner. This solution is known as the Open Forest Protocol (OFP): A blockchain-based platform and ecosystem built on NEAR Protocol for reliably measuring, reporting, and verifying forestation initiatives at scale in a permissionless, decentralized, and open-sourced manner.

Not only does this document detail the primary characteristics of the protocol itself, including its open-source application, and non-fungible token based management system, but it also explains how future digitization initiatives centered around the development of Satellite Imagery, Drone Technology, Artificial Intelligence and the Internet of Things (IoT) provide a technological pathway for improving the veracity of the protocol over time - as the world becomes more digital, and Web3 technology becomes the standard.

OFP Documentation Outline

The current Whitepaper provides a general overview of the most important facets of the Open Forest Protocol. However, further documentation exists for more details on specific protocol features. For a comprehensive overview of the OFP mechanism design, including the responsibilities and incentives of the different ecosystem stakeholders, please, see:

- Open Forest Protocol Crypto-Economics and Fundraising Design.
- OFP Mechanism Design. A shorter annotated version of the machinery behind the protocol.
- OFP DAO Governance (unreleased). Detailing the governance of OFP, the document details the responsibilities and composition of the OFP DAO while also outlining voting and conflict resolution procedures.
- OFP NFT Research Analysis and Architecture. For a specific overview of the role that NFTs play in the OFP Ecosystem.

Finally, for those interested in materials on OFP relating to specific stakeholders, a full suite of one-pagers and slide-decks are available on the OFP Website.

Part 1: The Need For A Trustless Protocol For Digitizing Forestation Initiatives

As climate consciousness has become more widespread among governments, non-governmental organizations, environmental organizations, and companies, new sustainability initiatives have received significant funding commitments from governments, international organizations, and charities. One of the most widespread and far reaching initiatives is [the trillion tree initiative](#) (1t.org) which has been embraced by concerned stakeholders around the world as a sustainable way to reduce up to 1/4 of CO2 levels in the coming decades. According to the [World Economic Forum](#), "The 1t.org project aims to unite governments, non-governmental organizations, businesses and individuals in a 'mass-scale nature restoration campaign'".

While this plan holds serious potential to prevent runaway emissions, it has faced considerable hurdles when it comes to coordinating different initiatives, as well as measuring, reporting on and verifying (MRV) global forestation initiatives in a reliable manner. As the [United Nations Framework Convention on Climate Change (UNFCCC)](#) explains, beyond simply planting trees, there remains a strong need to:

> "Establish monitoring systems that use an appropriate combination of remote sensing and ground-based forest carbon inventory approaches with a focus on estimating anthropogenic forest-related greenhouse gas emissions by sources, removals by sinks, forest carbon stocks and forest area changes. All estimates should be transparent, consistent, as accurate as possible, and should reduce uncertainties, as far as national capabilities and capacities permit."[1]

Beyond the need for a spectrum of different monitoring solutions, the UNFCCC additionally emphasizes the "need to involve local communities in

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[1] Martin Herold and Margaret Skutsch, 2011, Environ. Res. Lett. 6 014002.

the implementation and measuring and monitoring [of] carbon stocks," as well as in the general preservation of the forest in question.[2]

Based upon these considerations, the Food and Agriculture Organization (FAO), and the authors of a report commissioned by the European Union[3] have put forward a number of general recommendations for how data collection and management can be done in an organized and secure manner, summarized here:

- Data must be stored in a way that allows it to be retrieved using future technologies, including hardware and software.[4] Data systems require regular updates and consistent estimates over time.[5]

- Both raw field data and "clean" [remote] data needs to be permanently stored and backed up. Ideally, a single, current copy of the data will be stored on a central server (with an exact copy on another server), rather than as multiple versions on multiple individual PCs.[6]

- Once the information management system has been designed and installed, the entire system has to be documented. The documentation should include a description of the data (including its source, methodologies and assumptions), the database information system (including the database structure) and the metadata (i.e. a set of terms and definitions that

[2] Herold and Skutsch, 2011.
[3] Böttcher, H., Herrmann, L.M., Herold, M., Romijn, E., Román-Cuesta, R.M., Avitabile, V., de Sy, V., Martius, C., Gaveau, D.L.A., Fritz, S., Schepaschenko, D., Dunwoody, A., 2018. Independent Monitoring: Building trust and consensus around GHG data for increased accountability of mitigation in the land use sector. 112 pp. Publications Office of the European Union, Luxembourg. https://doi.org/10.2834/513344
[4] Food and Agriculture Organization of the United Nations (FAO), Voluntary Guidelines on National Forest Monitoring, http://www.fao.org/3/a-i6767e.pdf. Accessed on April 21st, 2019, 55.
[5] Böttcher et al., 2018, 14
[6] Food and Agriculture Organization of the United Nations (FAO), Voluntary Guidelines on National Forest Monitoring, http://www.fao.org/3/a-i6767e.pdf. Accessed on April 21st, 2019, 55 - 57.

describes the data in terms of availability, location and accessibility), if possible, in internationally standard format in accordance with data collection protocols[7], and datasets should include accuracy assessments and uncertainties.[8] Methods for data production need to be publicly available.[9]

1.1 Summary of Current Challenges

Altogether, the current challenges that forestation efforts face are largely consolidated around the need to digitize forestation systems so that verification is more precise, transparent and accurate:

- Robust digital monitoring systems are needed that can guarantee that trees have been planted, monitored, and preserved as they grow up to sequester carbon.

- Data about the trees must be managed effectively so that all parties involved can have access to the data according to international standards, and including data backups.

- Local engagement in monitoring forest carbon stocks, and forest area changes from reforested trees should be inclusive, open and non-exploitative especially in relation to the local population involved.

- A standardized system for creating carbon credits, based upon the verification and monitoring of trees is required if these credits are ever to be traded or exchanged on an open-market as offsets for government or company emissions.

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[7] Food and Agriculture Organization of the United Nations (FAO), Voluntary Guidelines on National Forest Monitoring, http://www.fao.org/3/a-i6767e.pdf. Accessed on April 21st, 2019, 55.
[8] Böttcher et al., 2018, 14
[9] Böttcher et al., 2018, 14

1.2 A Protocol Level Solution

A blockchain-based protocol pegged to a digital token is an innovative solution for providing the technical foundation and incentive structure of an inclusive, open, and permissionless ecosystem for managing forestation efforts around the world. A protocol built on top of an existing L1 smart contract platform, provides the following benefits to the problem of forestation management, specifically as it pertains to MRV mechanisms, and local inclusion concerns:

1. Decentralized Access and Global Inclusion: By definition, an open protocol provides the technical basis from which any stakeholder can participate in a forestation process according to the protocols' decentralized standards and tools; a common crypto-economy guarantees the same rules for all players - from governance to utility, to verification on the platform.

2. Standardization and State Concurrence: With a protocol that is both open and permissionless, a community of stakeholders has the opportunity to create a uniform scheme from which data pertaining to forestation projects can be uploaded: this scheme can be democratically enhanced or altered, based on community governance mechanisms of the protocol (i.e. DAO vote)[10]. As a result, protocol based - afforestation, reforestation, or preservation allows for the standardization of how tree data is uploaded, processed and managed. State concurrence meanwhile, guarantees that all data is universally available and permanently backed up.

3. Trustless Security: As a decentralized protocol, no single entity will own or manage the network and the rules governing the network: full decentralization means that decisions are taken collectively by

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[10] A DAO is a decentralized autonomous organization. It refers to a decentralized governance system organized around a specific set of values, projects, or goals. For more see: https://hackernoon.com/what-is-a-dao-c7e84aa1bd69

all of the stakeholders invested in the future of forestation and the mechanisms used to measure, report, and verify the veracity of projects. Data uploaded onto the protocol is unalterable and immutable.

4. A Sustainable Foundation for Future Innovation and Development Surrounding Forest Management: As a general purpose technology, blockchain provides a robust foundation for integrating future technologies into the protocol as they become more pervasive and cost effective into the future. Beyond software integrations with other IT systems, a protocol is also capable of managing and integrating data from Satellite Imagery, Drone technology, Artificial Intelligence and the Internet of Things devices. This is also the case in relation to sustainable finance and integrated technology solutions. Altogether, a protocol is not only a solution for solving current problems relating to forestation, it is also a foundation for enhancing future green technologies.

5. A Data Backed Carbon Credit: Aligning carbon sequestration data on a distributed ledger provides a unique opportunity to tokenize a credit of carbon in a fully decentralized manner. Distributed ledgers give way to 'data backed carbon credits' insofar as each credit created can be tied to a specific event and account at a specific time. Furthermore, using carbon credits as offsets can be exercisable on chain. As an example, the relevant credits can be burned (retired) on chain and a timestamped certificate being generated to ensure that the credit can no longer be claimed as an offset against any future emissions.

Overall, a blockchain protocol for MRV has the opportunity to not only address some of the largest MRV related challenges, but it also can provide the foundation for a new, standardized carbon economy based upon permanently uploading project data on-chain for the entire lifetime of the project.

Part 2: The Open Forest Protocol

The Open Forest Protocol (OFP)[11] is a blockchain-based platform that denominates a crypto-economic ecosystem for communal measurement, verification and reporting of forestation data. The OFP is built on top of an existing L1 blockchain (NEAR Protocol) and provides the following parameters for the ecosystem:

- A standardized validation and governance model for uploading, verifying, and managing data on the network;

- A georeferenced system for quantifying and recording plots of land being forested based upon minting a Non-Fungible Token (NFT)[12] for each project;

- A crypto-economic model for securely managing the upload and validation of forestation data;

- An open-source application and management dashboard for the collection of data surrounding forested zones;

- Developer tools for integrating with existing software and IT solutions and for developers and entrepreneurs to build new solutions on top of the protocol;

- A robust governance infrastructure built around a communally operated OFP DAO.

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[11] Forestation for the duration of this whitepaper is used as an umbrella term to refer to all initiatives and projects relating to afforestation , reforestation, avoided deforestation and natural forest regeneration or preservation.
[12] A Non-Fungible Token is defined as a token which possesses unique information or attributes, making it irreplaceable or impossible to swap for another. See more at https://cointelegraph.com/explained/non-fungible-tokens-explained

2.1 Blockchain-Based Platform, Open Ecosystem

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OFP DAO	Forester (Open Source dApp)	App Front End
Validator Area	**OPEN FOREST PROTOCOL**	Project Explorer
	Extensions & Integrations	Open Source Tools

Figure 1: The OFP Ecosystem and Tools for MRV and Entrepreneurs

The Open Forest Protocol is first and foremost a platform that establishes a new ecosystem for managing forestation data in a standardized manner. While the ecosystem's purpose is to create value through regeneration of forests and provide on-chain MRV, it will be characterized by different stakeholders using different facets of the protocol for their own projects:

- Entrepreneurs, Companies, and Nonprofits work to create solutions and dApps for measuring, reporting, and verifying the levels of forestation of a particular plot of land and the trees contained therein. The business context for these stakeholders is explained clearly in the Nature Report: The Business of Planting Trees.

- Developers can build enterprise specific DApps, markets, or services on top of the protocol for displaying forestation data, pioneering social/local inclusion mechanisms, or funding opportunities for new forestation projects.

- Any stakeholder, be it a local city government, non-governmental organization, international organization, or corporation can build their own solution on top of the Open Forest Protocol, using the tooling and structures embedded into the platform. All solutions built on top of the protocol layer run according to the same state, data, and crypto-economic model in a trustless and open environment.

In unison, startups, governments, environmental organizations, and nonprofits all stand to benefit from the value created by a decentralized, open and permissionless platform for managing forestation efforts. Not only is OFP a valuable means for project MRV, but it also may allow project operators on OFP to monetize their projects using a standardized carbon credit from the sequestered carbon sometime further in the future. Meanwhile, the protocol layer itself provides the core tools and immutable data structure for many of these initiatives: The different ecosystem participants jointly utilize these tools and structures over time, to sustainably create an inclusive and innovative environment for better monitoring of forestation initiatives and the value created therein.
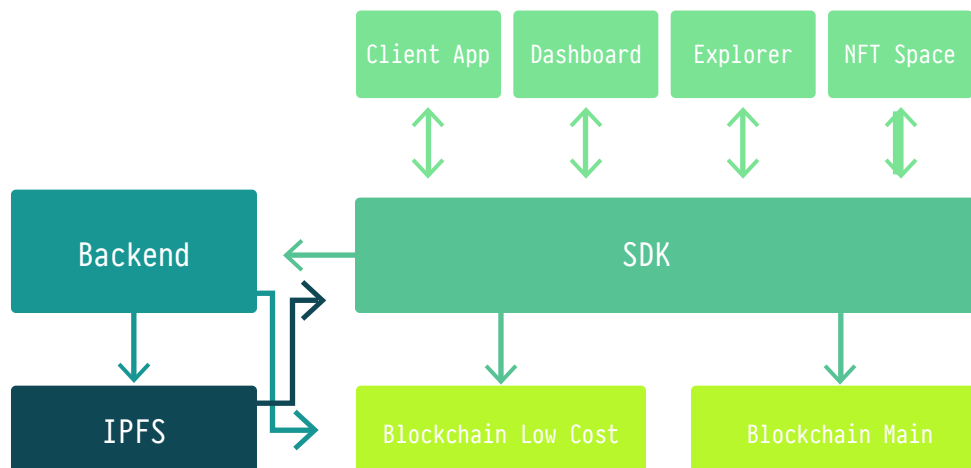
As the schematic above demonstrates, OFP is designed as a Layer 2 solution built on top of a larger Layer 1 Protocol. Above OFP, as a L3, any application can build its own custom solution on top of the protocol be it, for example, a dApp, or decentralized exchange for carbon credits, or private forestation solution.

2.2 The Open Forest Protocol: Non-Fungible Token Based Management of Forestation Projects

As a solution for standardizing, scaling, and financing forestation initiatives, the OFP has the potential to revolutionize and digitize forestation initiatives using the OFP collective data verification model, governance DAO, and its own NFT-based design.

To accommodate the geospatial nature of forestation, the OFP integrates the capacity to mint non-fungible tokens for a designated forestation zone, spanning multiple plots of land. These tokens are representative of the land area in which any particular forestation project takes place. The NFTs can be modified while data surrounding possession, trees planted, verification efforts can be updated, and possibly even digital carbon credits yielded. Once created, it is close to impossible to create two geographically overlapping NFTs, due to the protocol mechanics of validators accepting data uploads, and any user able to explore all existing projects on the network.

Users uploading data onto the protocol for a specific forestation project, will by default mint an NFT and any additional parameters inside of it at the beginning of the project. This process is built into the open-source application, and thus makes NFT-based management of projects a natural extension for managing forestation data. In this way, OFP enables the creation of entirely blockchain-native representations of forestation projects that can be managed, edited, and transferred by the owner.

2.3 The Open-Source Application: The Forester Dashboard

Central to the Open Forest Protocol mission of providing open, permissionless access to managing forestation data, is the open-source, web2 application,

the Forester Dashboard. The Forester Dashboard provides a single, clean interface for any entity or organization to create an account from which standard data surrounding a forest project can be uploaded. The data input - manually - includes:

1. Project Name
2. Project Developer
3. Project Type
4. Project Description
5. Project Goals
6. Co-benefits
7. Community involvement
8. Project duration
9. Geolocation
10. Surface area
11. Approximate number of trees
12. Tree Density
13. Tree Species
14. Project icon and photos
15. Additional Documentation (if relevant)
16. Account Wallet for Managing the NFT and paying transaction (gas) fees on the protocol.
17. NFT ID

As an open-source application, it can be cloned and enhanced by private companies looking to provide more holistic or comprehensive solutions. For example, different parameters can be added, such as IoT sensor data, drone footage, and further analytics. Additionally, more robust technologies can be integrated if the MRV demands become more stringent (for more see Part 6 - The OFP Vision - A 10 Year Plan).

Overall, the open-source application functions as the standard-level tool for collecting forestation data. Uploading such data is done through the payment of a small transaction fee in NEAR (that will be automated in the future using Croncat).

2.4 How OFP Works

STEP 1: Land plots with forestation projects are registered on the Open Forest Protocol and made public on the OFP Explorer.

STEP 2: Forest monitoring data is recorded on the ground using the OFP field mobile app.

STEP 3: Validators around the world check the legitimacy of the ground data.

STEP 4: All monitoring information is stored permanently on the blockchain.

STEP 5: Forestation projects gain unprecedented transparency and trust.

STEP 6: Project operators can get access to carbon financing when forestation projects are successful.

2.5 Tools and Integrations of the Protocol

In order to fully benefit from the full scope of services offered by the Open Forest Protocol, open-source tools including Software Developer Kits (SDKs) and a general REST API offer developers and companies the capacity to build front-end and back-end solutions on top of the protocol for specific business, design, or non-profit purposes. An additional API allows for the integration of data relating to the NFT-based georeferenced area into other applications, as well as for potential carbon-credit market purposes.

In essence, the SDKs (Software Developer Kits) and API (Application

Programming Interface) available on top of the protocol ensure that it can be easily connected - or can easily connect to existing software or developer interfaces for business or financial purposes - including the countless other nature-related areas (maritime conservation, carbon sequestration in soils, land tenure, urban forestry and land management, ecosystem protection) that await digitization.

Part 3: Open Forest Protocol Crypto-Economics

A robust crypto-economy is a fundamental component of every open-source protocol running on a public blockchain. As a platform exclusively focused on forestation management, a crypto-economy naturally encompasses the diverse functions from different stakeholders within the ecosystem. These functions notably include: data upload onto the protocol, validation of project data. In this crypto-economic model, one token operates as the fundamental value parameter and utility of the ecosystem: $OPN Tokens (Open Tokens).

3.1 OPN Tokens

OPN Tokens are the representation of utility and governance on the Open Forest Protocol. OPN's are used for the following purposes:

OPN Token Functionality:
Granting access to Open Forest Protocol
Validate to Accept or Challenge Project Data Uploads
Govern the Open Forest Protocol via DAO Vote
*Indirect Function: Earn Fees in OPN to for Validation of Data

OPN tokens are a utility token used to provide access to stakeholders interested in securing the protocol and the validity of the data uploaded. OPNs are used to verify or challenge the accuracy of a specific MRV data upload and to govern many different parameters of the protocol. OPNs are not used by project owners, but rather rewarded to validators and possibly collateral providers.

With a delegation-based validation model, validators can lock up or incorporate delegated stakes from token holders as a means for securing

data uploaded onto the network, and earning the validation reward from the validation rewards pool.

If at any point in the data upload phases of a forestation project the forest data appears to be false or an insufficient representation of the reality on the ground, - validators may put forward a challenge in an attempt to win the OPN tokens from the rewards pool.

Challenges are managed by validators staking on the outcome of data uploads using OPN tokens. The validators involved in proving the accuracy of a challenge are entitled to the validtor rewards pool if data is proven false. With such a structure, the veracity of the data being uploaded is naturally incentivized to be more accurate, while actors are financially dissuaded from behaving maliciously.

3.2 Open Carbon Credits (OCCs)

Among the variety of possible solutions that can be built as a layer 3 on top of OFP in the future (various dApps, private forestation solutions, etc.), one of the most prospective (in terms of possibility to track reduction of CO2) can be a digitalized carbon credits solution (for the sake of reference, referred herein as "Open Carbon Credits" or "OCCs").

Open Carbon Credits can be built as a separate zone on top of OFP. Open Carbon Credits could be automatically created when data relating to trees or other carbon sequestration initiatives mature to a point in which the forestation zone sequesters carbon of a quantifiable amount. This maturation point may be openly decided upon by the Open Forest Protocol DAO, and may be capable of being changed via, for example, governance vote over time. That is to say, the initial parameters for what constitutes an Open Carbon Credit and at what point in a projects' life cycle they can be yielded

based upon the carbon sequestration rate of the forestation zone can be a prime governance opportunity for the OFP DAO. The OFP DAO may eventually manage this process and alter it as needed into the future.

OCCs can be imagined as digital representations of sequestered carbon. All OCCs may be created in direct correlation to a specific data upload. For the Open Forest Protocol, this may be on an NFT-denominated forestation zone which includes the current state of carbon sequestration by trees. Upon minting, OCCs could be dropped into the account wallet of the uploading user, with a small 8% protocol fee taking a portion of the token and distributing it out to OPN token holders. Such OCCs could hypothetically be then tradeable on the open-market or as real representations of carbon backed credits from trees sequestering carbon. Due to the parallel nature of OCCs (i.e. OCCs may only be created once data confirming the maturation of the trees is uploaded) with the growth of the trees in question, OCCs may serve as a truly data-backed carbon credit directly tied to a specific forestation project.

The standard for what amount of sequestered carbon qualifies as a carbon credit, and at what point of maturation are carbon credits minted may be decided upon by community governance vote in the OFP DAO. Importantly, the creation of carbon credits could be directly correlated with the growth or destruction of a plot of reforested land. As a tree matures over time to sequester more carbon, more credits will be created. However, in the event that a tree or plot of land is destroyed or dies prematurely, carbon credits are no longer created. (with foundation-operated reserves offsetting the equivalent of the lost amount).

In context, OCCs could become one of the world's first open-data backed credit schemes, in which all carbon that is credited can be traced back to a specific project and specific data uploads from that project over time. To

jump start the new carbon economy, any project using OFP may be eligible to receive carbon credits in virtue of uploading data onto the network: Not only does this increase the reliability of all future carbon credits issued through the protocol (as all data is backed from the projects creation), but it also provides new business models for forestation companies and entrepreneurs alike (small and medium projects especially).

Part 4: The Open Forest Foundation

Governance of the Open Forest Protocol will be decentralized with voting on standardization surrounding forestation, land tenure, and further protocol advancements, managed by the community of stakeholders within the ecosystem. This relates to the governance of the protocol described in Part 3: Open Forest Protocol Cryptoeconomics.

At its inception and in the early years of the protocol, a non-profit foundation will govern the Protocol and grow the OFP Community Ecosystem. In particular, the foundation will focus on accelerating the implementation of climate and environmental technologies. This foundation is known as the Open Forest Foundation - representative of the first vertical for forestation developed by the OFP Team.

Open Forest Foundation is to be established in Switzerland, which is a world-recognized political, economic, social, and cultural environment as well as being one of the most crypto-friendly countries in the world.

Open Forest Foundation will aim to set up and develop digital tools and a community to increase the transparency and scale of forest-related (reforestation, afforestation, conservation, etc.) activities, in particular:

- Create and develop a permissionless, autonomous and independent Open Forest Protocol Ecosystem on public blockchain with new, open-source software architecture for measurement, reporting, verification of environmental data and development of solutions, leading to carbon sequestration and financing,

- Research, testing, development and deployment of new open-source software architecture components of Open Forest Protocol,

- Work at growing the Open Forest Protocol ecosystem and community by increasing the volume of stakeholders and value onto the Open Forest Protocol, development of various solutions for different nature-based verticals.

On the longer term, the Open Forest Foundation will aim at:

- Working to scale and promote the value proposition of the Open Forest Protocol with partners and like-minded organizations,

- Create a uniform and consolidated platform for all and any possible nature-related vertical to be developed.

The Open Forest Foundation's mission is to launch, grow, and develop the Open Forest Protocol guided by the spirit of open, permissionless, and decentralized forestation data management. With community voting, responsibilities of the foundation will be incrementally transferred to the DAO.

Part 5: Client Development and Product Deployment

In light of ongoing forest-related initiatives such as the 1 Trillion Tree initiative, it is important to emphasize the compatibility of the Open Forest Project with other existing initiatives: as a dApp on OFP, OFP provides a data architecture that is open, secure, and permissionless to use. Beyond these basic parameters, the protocol can be integrated with existing applications and other forestation solutions across the spectrum: Among emerging technology providers, existing applications deployed for tracing trees, and with organizations already pursuing certain forestation goals. Actively integrating with the forestation goals of such existing initiatives is important for the development of the protocol in the long term.

In this context, the core 'clients' of the protocol are multiple and varied depending on the type of engagement with the protocol.

First, there are project operators - or the primary clients of the protocol interested in uploading forestation data for their MRV needs. Stakeholders of this type of client include:

Project Operator Clients	Description
Existing Forestation Organizations (Reforestation, Afforestation, and Ecosystem Preservation)	63 million trees planted by 142 participating projects in the 1 trillion tree campaign.
Non-Governmental Organizations	15,000 environmental organizations just in the US, possibly over hundred thousand across the world

Project Operator Clients	Description
Nation States and City Governments	Developed countries have made a promise to raise $100 billion per year in climate finance, from both public and private sources, by 2020 to help developing countries tackle global warming; by 2025 $100 per year will be the floor C40 Cities connects 97 of the world's greatest cities (25% of world GDP) to take bold climate action: 80 are committed to develop 1.5C aligned, resilient and inclusive climate action plans and 12 C40 have already completed the plans
Climate Entrepreneurs and Developers	VC invested in climate tech between 2013-19 is $60 billion and has shown a CAGR of 84%; If the CAGR is only 20% between 2019-2030 it will get to $450 billion by 2030. 1,200 climate tech startups, 43 of which are unicorns (valued over $1B+). Climate finance flows amounted to USD 548 billion in 2018 (private vs public actors 56%:44%); "Agriculture, forestry, land-use, and natural resource management" amounted to USD 20 Billion for 2018

Second, there are 'validators' or those who will be accepting or challenging uploaded data, as well as earning a small fee from every project that utilizes the network. These stakeholders are those willing to purchase and hold OPN tokens for the long term, both for rewards and DAO governance benefits.

OFP Validators May Include	Description
Private Investors / VC's	$326 billion USD in private capital investment over 6 continents $2 billion in commitments from investors in Latin America and Africa to allocate a part of their portfolios to restoration investments.
Climate Organizations and Technology Companies	$22 billion annually in 2015 and 2016 of public adaptation and resilience finance from government and bilateral aid agencies, climate funds, and bilateral, multilateral, and national finance institutions
Climate Consultancy / Private Companies	Close to 1,200 companies (and rising weekly) have made net zero before 2050 pledges
Traders	Investors that represent over $52Tr assets under management (AUM) have signed on to drive action on climate change across their portfolios, from portfolio decarbonisation to climate risk disclosure and the use of shareholder levers

Third, there is a small position for clients who are solely interested in the DAO benefits of voting on the protocol. While more often than not these stakeholders will also stake their OFP for some form of return as validators, there are certain clients for simply managing the governance decisions of a protocol like OFP:
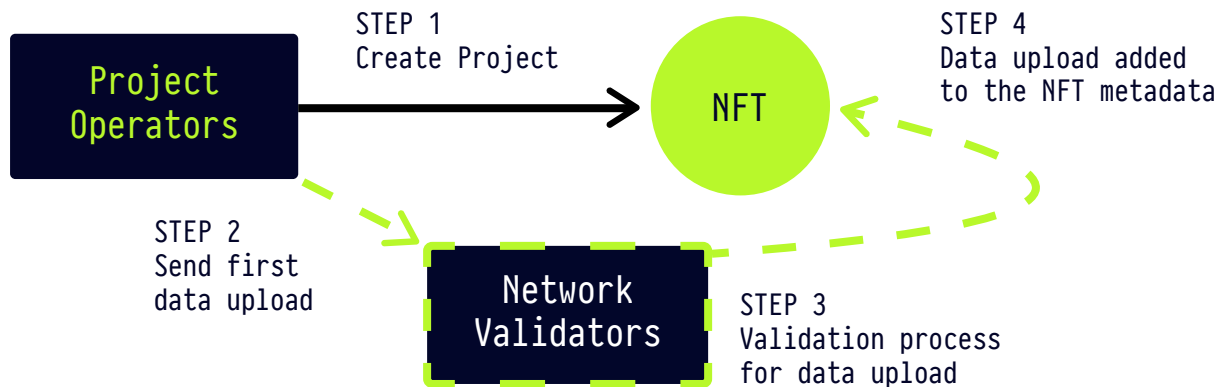
OFP DAO Participants
Climate Advocates
Environmental Organizations
Private Companies
Early Contributors / Backers
Non-Governmental Organizations

The different stakeholders involved in OFP are numerous and largely based on their specific interests (uploading data for MRV; Earning Fees and Managing DAO Governance). It is expected that as the need for secure and verifiable environmental data grows in the coming years, more stakeholders will onboard to the protocol for the different incentives outlined above.

5.1 Launching a Forestation Project Within OFP

Launching a forestation project on OFP starts with creating an account on the OFP Open-Source Application, the Forester Dashboard. Project Operators are prompted to input forest project details (Section 2.3) that will then be recorded on the newly minted NFT.

The project operator can then set up their project's monitoring zone and sample plots. The trees contained in the sample plots will need to be monitored on the ground. Data such as the trunk diameter, tree height and photos will need to be collected on the ground.

STEP 1
Create Project

STEP 2
Send first
data upload

STEP 3
Validation process
for data upload

STEP 4
Data upload added
to the NFT metadata

Project Operators

NFT

Network Validators

As the graphic above demonstrates, once a project has been created, the project operator can then proceed to upload their first set of monitoring data onto the protocol every 6 months for the first two years (the first one beginning 6 months from the defined start date of the project). Once this first data upload has been through validation (and possibly challenge and escalation) it then is added to the NFT metadata. Stage 2 then begins and this process (data upload, validation, data added to NFT) continues for the entire lifecycle of the project.

5.2 Integrating as a Technology Provider

Technology providers who are able to provide extensions to project operators with their specific technology, can apply to be whitelisted by the OFP DAO and to integrate as a 'plug-in' on the open-source application.

5.3 Developing Solutions on OFP

Building or integrating applications on top of OFP is easy using open-source Software Developer Kits as well as the OFP API. Developers can build proprietary or public applications for any aspect of the ecosystem: Project Operators, or Validators. Future integrations with DeFi and the Creator Economy are also easily possible.

Part 6: The OFP Vision - A 10 Year Plan

Climate Tech 2.0 is only just getting launched. As has [been reported by Quartz](#) and many others, contributors, entrepreneurs, and technologists are preparing for another wave of climate innovation in the hopes of mitigating the most damaging and catastrophic effects of climate change.

The long-term vision of the Open Forest Protocol is to provide an open, permissionless, and easily accessible backbone for a new generation of forestation projects (reforestation, afforestation, and conservation) backed by clear MRV practices, and a new ecosystem of carbon sequestration initiatives with truly data-backed carbon credits. While forestation solutions have been noted as the most immediate need for companies, governments, and NGO's everywhere, the core design of the protocol is such that it can also easily accommodate solutions beyond forestation. Including:

- Maritime Conservation
- Carbon Sequestration in Soils
- Land Tenure
- Urban Forest and Land Management
- Ecosystem Protection

The fundamental value proposition of OFP, is that it may become a decentralized and communal platform for handling carbon sequestration projects. This future vision is such that an Open Planet Network could be imagined forming around the Open Forest Protocol, in the medium-term future.

The underlying principles of transparency, data immutability, open-access, and shared governance, mean that OFP will only become more important as time goes on, and climate entrepreneurs and investors realize the value

of an open-protocol that standardizes access and rewards. The potential to accredit OCCs on top of the protocol, is a further gamechanger that has the long term potential to ground an entirely new carbon economy: One that is not fragmented and individualized among companies, but rather, one that is community governed, and standardized for any project in the world using the protocol.

Context is key in understanding this vision: Over the next 10 years, Nature has estimated that The Business of Planting Trees will grow to become a multi-billion dollar industry. In parallel to that, McKinsey estimates that the market for carbon credits will increase to be valued at over $50 billion USD value. In this environment, OFP is positioned to become a global standard for the long-term future as its value proposition is incomparable to any traditional accreditation or MRV scheme.

The long-term protocol governance will be handled by a community of invested stakeholders, via the OPN token. The OPN token, beyond being used for validation purposes, is equally important for future protocol governance, interested in setting protocol rates, adding new requirements for standards, and handling other aspects of OFP that will need upkeep and management over time. As more stakeholders onboard as either project operators, or validators, the importance of proper management will equally increase in importance.

Project operators meanwhile, attracted to OFP for its data transparency and collective MRV benefits, have the unique opportunity of also monetizing their forest and carbon-sequestration projects by possibly receiving data backed carbon credits. For the first time a cyclical and commercially viable model for funding, tracking, and rewarding carbon-sequestration projects can be realized by a community of passionate and involved stakeholders.

Part 7: OFP Roadmap

Launching the Open Forest Protocol involves the development of the ecosystem on multiple fronts. As such, there are multiple different development timelines for the different facets of the protocol. When taken altogether the development of OFP can be broken down into Four Core Stages:

Stage 1: Preliminary Buildout (Q4 2020 - Q2 2021)

Stage One is characterized by the need to build out the very foundational building blocks of OFP. That includes initial prototype development, back-end protocol design, client planning and outreach, finalizing core documentation, core team onboarding, and strategic planning on branding, messaging, and outreach into the future. Deliverables from this stage include:

- Documentation on the Mechanism Design, NFT Structure, Protocol Architecture, Crypto-Economics.

- Initial outline of potential clients across categories: reforestation and afforestation companies, non-governmental organizations, charities, and environmental organizations, etc.

- Branding, Core Messaging, and Content Planning of Outreach and Promotional Materials.

- Initial Technical Documentation and planning with the creation of a minimum viable product (MVP) featuring the open-source dashboard and user application Forester.

Stage 2: Testing and Stealth Development (Q1 2021 - Q1 2022)

Stage two is the longest and most essential stage in the development of OFP. In this stage the original building blocks are built upon further across verticals of the protocol: Back-end development of the actual protocol begins, alongside client and contributors outreach, as well as community and entrepreneur development. The initial prototypes are completed, and PoCs begin with selective clients on private test-net. While the core protocol infrastructure remains under heavy development (including the NFT integration with the protocol, the development of the validator area), the other core components that make up the ecosystem are built out: SDK's and API's, management interfaces for validators and project operators, respectively. Deliverables from this stage include:

- Working Forester Dashboard Prototypes and beta testing of the protocol by project operators and validators.

- Protocol Design and Development of the NFT infrastructure, core validator area.

- Launch of OFP on private test-net, including QA, optimization and auditing of contracts.

- Rounds 1 and 2 of private fundraise.

- Release of developer tools and documentation for building on top of the core protocol.

Stage 3: Public Launch (Q2-Q3 2022)

The public launch of OFP will take place shortly after the public token generation event. Stage three is characterized by the incremental release of the different features of OFP protocol: It will become public when OFP validators collectively vote to launch the protocol and OFP DAO simultaneously.

- Public Token Generation Event of OFP Tokens.

- Launch of Main Network V1.

- Launch of Public Validators.

- Launch of OFP DAO.

- OFP is Open for Developers and Entrepreneurs to Build Solutions On Top of OFP.

Stage 4: Progressive Decentralization (Q3 2022 - and further on)

The fourth and final stage of the current OFP Roadmap relates to the progressive decentralization of the protocol after launch. This development would see OFP become a fully autonomous and permissionless cloud-platform for MRV. Additionally, in case of introduction and accreditation of Open Carbon Credits onto the platform, OFP may stand out as the first platform for Carbon Sequestration initiatives. Prospective developments include:

- Possible Implementation of the OCCs Standard into the protocol architecture.

- Decentralization of decisions made via transfer from OFF to OFP DAO.

- Development of Open-Source Dashboards for Other Industry Verticals.

Conclusion

The Open Forest Protocol creatively draws upon blockchain technology to solve the problem of providing transparency in the measuring, reporting, and verifying of forestation projects across the globe. It provides the foundation for rapidly scaling forestation projects through its open, inclusive, and permissionless protocol, so that the world can rapidly draw down CO_2 and together with the rapid phasing out of fossil fuels can stabilize the climate at levels that will allow for the flourishing of ecosystems and the human community.

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