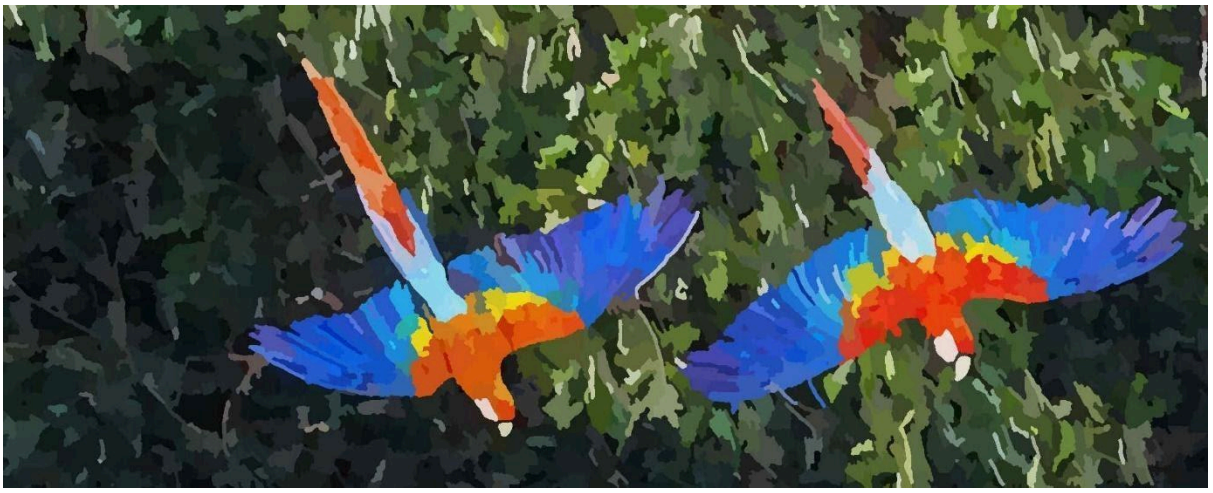
Article about tokenizing for Nature Protection



Towards a digital architecture for the protection of the Amazon Rainforest

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This article will be part of a series that looks at several aspects of technical support for nature protection in the Amazon region and beyond.

This opening article, part 1, focusses on rewarding people, landowners, and communities for nature protection via tokenizing the process of establishing tenure, monitoring, and executing these protection measures and their rewards. These programs can be used for nature protection programs, with the aim to to halt the destruction of forests, biodiversity loss, conserve wildlife, empower Indigenous practices of guardianship, increase the well-being of communities, create meaningful jobs and very importantly, fight climate change.

Setting the Context

The Amazon Rainforest is at the tipping point of dying back within the next decades. A runaway drying out and dieback of the Amazon Rainforest present unprecedented challenges to humanity. Its additional warming effect on the climate, the effect on food production and prices, biodiversity, drinking water supply, electricity production and the quality of life of hundreds of millions of people will be a blow strong enough by itself has the capacity to derail global complex society.

The latest science shows that the impact of tropical forests on the climate through the hydrocycle and the interaction between forests and the atmosphere is much larger than so far assumed. The impact is not just caused to carbon sequestration, but to an even larger extent through air cooling via evapotranspiration through foliage, heat transport to the higher atmosphere, albedo effect of cloud forming over the forests, radiating sunlight back into the atmosphere, the biotic pump function sucking in humid air from the ocean and making it rain out over the forest through delivering condensation seeds. In fact there is now initial proof that frontloading reforestation and forest protection can slow down and reverse climate change within our lifetime. By far the largest effect will come from the tropical zones where carbon sequestration can reach 20 tonnes of CO_2 per hectare per year.. The total amount of cooling, considering all the factors, would make the fight on climate change suddenly much more viable and cheaper than previously thought when looking at the total impact. Tokenizing Nature Protection would be a major tool in the toolkit to get this done at the scale, speed and granularity required. Because it needs to start soon as we are running out of

time as global sinks are turning into sources of emissions and heating through forest dieback and destruction.

Part 1 – Tokenizing Nature Protection

The idea behind tokenizing using blockchain techniques, revolves around efficiency, automation and self-executing business logic in the form of smart contracts, without further human interference based on a set of agreements. The idea to use these techniques for Payment for Eco Services (PES) is centred around the possibility to gather global resources to support forest protection, reforestation, and sustainable agroforestry to create efficient systems that can scale fast and can support the forest dwellers on the ground, based on the famous triple bottom line of people, planet and profit, averting the tipping point of dieback of the Amazon Rainforest.

This digital infrastructure connects all stakeholders with information, communication, assignment of ownership, network tools and monitoring. These properties together provide the framework for a system of PES that can profoundly support the protection and regeneration of the Amazon Rainforest, be a major tool in reversing the dieback and provide the infrastructure of a future thriving bioeconomy that reaps the benefits from actively managing the forest for its inhabitants, not from destroying it.

THREE MAIN PILLARS OF A DIGITAL ARCHITECTURE FOR NATURE PROTECTION

The digital infrastructure has three main pillars: a platform & marketplace for regenerative projects, a system based on blockchain to pay for ecoservices with what we here call tokens, which are the basic units of contract and a system that connects the forest dwellers via internet and applications to information, communication, trade, and PES, connecting the now millions of unconnected people, including the areas first nations, to a regenerative economy while increasing their well-being in a thriving natural environment.

THE TOKEN UNIT

The tokens are the principal units for the measurement of parameters, connecting them to PES, awarding people and communities for nature protection. These parameters can focus on the health of the forest in several ways, including establishing biomass and biodiversity, or very specific elements such as rare species of animals, plants or ancient mother trees.

AGROFORESTRY

In the case of sustainable agroforestry systems, it can set parameters to separate it from unsustainable land use. The Oxford dictionary describes agroforestry systems as land management practices in which trees and shrubs are produced on the same land area as agricultural crops or livestock, to increase diversity, productivity, profitability, and environmental stewardship. Here it is important to note that for the purpose of a properly functioning hydrocycle on agroforestry land, multi-layered canopies and undergrowth as well as thick layers of fertile soil are all important to absorb and evaporate rain, reducing runoff, cooling the area and producing breezes all crucial to a gentle climate.

THE EMERGING TOKENIZING PROJECTS

Paying for Eco Services via tokenizing for nature protection programs, if designed well, will help halt the destruction of forests and biodiversity loss. It will help conserve wildlife, empower Indigenous practices of guardianship, increase the well being of communities, create meaningful jobs and last but not least, fights climate change.

Tokenizing for Nature protection through blockchain based PES is fast gaining traction as a strong tool to stop the destruction of the Amazon rainforest and help its urgently needed regeneration. We have interviewed seven project leaders and will list these projects at the end of this article. The success of tokenizing programs is dependent on several aspects, among which are effective and efficient establishment of land tenure and of environmental monitoring, principally through satellites, coupled with

the efficient, equitable and timely distribution of rewards with minimal transaction costs, making them scalable over large areas and dispersible to units as small as households and individual persons.

THE INVOLVEMENT OF THE LOCAL POPULATION IS CRUCIAL

Tokenization programs need to be designed to include local people in its management in order to be effective and equitable. This includes democratic decision making and translation into smart contracts of the implementation of PES distribution to serve the communities and individuals in those communities in an equitable and transparent way,increasing the overall well being of the forest dwellers. The process will also need to include linking them to the increasing market for forest produce and bioeconomic activities. This market will grow over time, increasing the forest communities' economic independence from PES over time, while keeping sustainable land management.

The authors want to warn here that the race to tokenize can lead to the purchase of cheap land by outsiders without empowering the local people, potentially increasing land prices and making them less affordable to the local people. This form of neo-colonial behaviour by wealthy people and organisations, quite often based in big cities thousands of miles away, needs to be avoided, not only from a moral perspective, but also because it is unlikely to be effective in protecting the forest.

CONNECTING THE WORLD TO TOKENIZING FOR NATURE PROGRAMS

Payment for Eco Services is supported by a series of demands in the today's global markets, including the increasing drive and pressure on companies to set up robust ESG programs and offset greenhouse gas emissions through carbon offsets as well as the pent-up desire of people, especially in the Global North, to actively engage in efforts to stop the destruction of nature.

We also see increasing legislation around the world to make economic activity such as food production sustainable by demanding proof that no forest has been destroyed in its production, such as the recently announced landmark EU anti-deforestation law proposal, meant to clean up supply chains. It puts the burden of proof on producers, meaning they need to make their whole production chain transparent.

These drivers will only increase in the coming years because of an expected increase of the price on carbon, the increasing possibilities to make the Voluntary Carbon Market move into the direction of the mandatory market, like the EU-ETS system, which requires stricter regulation but commands much higher prices. As the market matures a new asset class will be created that will become a regular part of investment portfolios of large institutions such as pension funds, national wealth funds and investment management companies.

OWNERSHIP, TRANSPARENCY, EQUITY AND AVOIDING CORRUPTION

Tokens are based on block chain or distributed ledgers, basically a database that is shared, and updated across multiple sites, institutions, or geographies, accessible by all stakeholders and the data are not owned by anyone in particular. This allows for the immutable registration of land tenure, not necessarily coinciding with national systems of formal registration and even breaking the gridlock of decades old conflicts on the ground about ownership. For instance, an Indigenous Territory in Brazil is government owned land to be exclusively used by the Indigenous people that live there. But the tokens can be established as being owned by those Indigenous people and therefore owning the PES rewards. Basically it can secure property rights and the usufruct of it in a different way, bypassing huge bureaucratic hurdles.

Tokenization allows for total transparency towards all stakeholders or if so defined, even the world as a whole, because the underlying data can be, and should be made accessible to at least all stakeholders involved and technically that is an easy feature to accomplish.

This transparency of token ownership and related transactions of PES rewards also avoids hoarding and corruption and thereby distributes power.

SEVERAL FORMS OF LAND TENURE

The Amazon region is part of nine countries and has a patchwork of different forms of land tenure, such as local and federal government lands, including specially protected areas such as nature reserves and Indigenous territories, as well as small holder properties and large tracts of privately owned land. Quite

often land titles overlap or are unclear and local customs can attribute land to others than official registration. There are also a lot of landless people in the forest area, often living at the margins of society. In all these situations tokenizing for nature protection needs to include all the people who lay claim to those lands or are dependent on the usufruct of it.

Land tenure in Brazil: The question of regulation and governance

In the tokenizer projects that the authors have encountered we see basically four models of tokenizing; the outright buying of land to tokenize, leasing and contracts that sell the obligation to protect landowners, including communities in return for financial support to keep the forest intact. Last and possibly the best model is to consensually establish factual ownership, possibly shared ownership and award immutable and non-tradable tokens to local communities, giving them the flow of PES awards.

GOVERNANCE AND MANAGING THE PES AWARDS

The community can decide how the money is used, for example, to pay forest rangers for patrolling, to compensate farmers with carbon credits for the biomass on their land or for community infrastructure, such as free internet, schools and salaries for teachers and health care workers. The community also needs to consider the effect on the larger region, establishing good relationships with neighboring communities, possibly letting them share in the benefits of new income streams and economic activity to avoid adverse effects and even have positive effects radiating out from the tokenized area.

The policy guidelines for developing good governance and decision making of communities in the program are crucial to creating a positive effect on the well-being of the local people, creating the circumstances for thriving socio-biodiversity. In this regard the authors like to point to the Elinor Ostrom Design Principles. Elinor Ostrom shared a Nobel Prize in Economics in 2009 for work exploring “The Tragedy of the Commons” and elaborating how communities are successful at managing common pool resources, or not. The work demonstrates how a community can be self-sustaining without one element exploiting another.



Source: David Dao, 2018 Decentralized Sustainability

HOW SMART CONTRACTS ALLOW FOR UNIMPEDED IMPLEMENTATION OF DECISIONS

Tokenizing allows for smart contracts of pay out of benefits, once they come in according to the rules set in the contract. It basically frontloads the execution of all decisions into future payments based on incorruptible data. This makes the benefit distribution technically tamper-proof. It can hold any number of recipients, which could be schools, a medical post, road maintenance parties or simply a village or individual households.

Distribution goes automatically once agreed without further human interference and is completely transparent online for stakeholders. Transactions can be scheduled in an agreed pattern and because of the near zero transaction costs can also be as frequent as possible, even daily if so decided. Also, they can

be pre-defined as stopping after a period of time or stopping if some of the parameters suddenly changes, e.g. satellite monitoring sees a decrease in biomass on a piece of land.

Payment of additional services such as payment of internet services, or installment payments on a solar energy installation, can be automated and get priority over discretionary income, allowing for access to services that would previously not have been available to people in the forest. The PES scheme can also persuade financial institutions to give access to affordable forms of financing of houses and other larger items.

Overall, the precise timing of PES payments is an improvement in benefit distribution because payments cannot be withheld by individuals, and recipients can therefore rely on the payments being delivered on time. Again David Dao gives some guidelines for the development of these contracts. I still need to talk to him about samples and examples.



Source: David Dao, 2018 Decentralized Sustainability

POSSIBLE WEAK POINTS IN THE SYSTEM

To reap the benefits of immutability and transparency, stakeholders must be able to understand the technology or the decisions of a community on how to deal with the payment structure (who gets what, when, for what, etc). Ideally this would be a skill held by someone trusted within the community or otherwise needs to be translated by a trusted, affordable intermediary.

For now the PES awards will be translated into existing local currencies, via an existing bank and more and more via payment services on a smartphone or computer.

MONITORING TOKENIZED LAND

Monitoring tokenized land as a basis for eco services payments, can include elements like remote sensing of biomass and biomass increase, remote sensing of canopy health and additional monitoring such as audio monitoring of bird and insect sound or evidence of wildlife observations (footprints, sightings). These observations can be done by camera traps of solar panel driven satellite internet enabled, but high cost for now, plus it needs human analysis of the footage. High speed playback with time stamps can decrease the human analysis cost considerably and can be done locally, but this has the danger of bias.

Ideally remote sensing algorithms could be linked to the execution of smart contracts on blockchain leading to automated PES payouts to contracted stakeholders with very low transaction costs and no human interference once the process is established. The automation of carbon credits payouts based on satellite monitoring is already technically feasible. This mechanism needs proof-of-concept as soon as possible in pilot projects. Once that is done, tokenizing for nature protection programs could be a game changer in the regeneration of our Planet and the fight against climate change, biodiversity loss and poverty of the rural poor in the Amazon and other areas.

GLOSSARY

- **Token and Tokenization**

- NFTs or “Non-Fungible Tokens” are unique, identifiable assets or “tokens” stored on a digital ledger.

- **Discoverability and Comparability**

- In order for a token to be traded, it needs to be discovered and usually compared to similar items. Technically, “discoverability” is the process of adding meta-data to an item so it can show up in larger dictionaries or search engines. Examples include annotation protocols in scientific literature and Google standards for meta-tags. It is important to make the properties of tradeable items comparable. The metric system is an example of how basic units like meters and liters make comparability possible. To scale, systems of nature tokenization assets will need standardized metrics like size, carbon sequestration capacity, biodiversity, deforestation risk, cultural importance, and more.

- **Interoperability and Tradeability**

- The technical aspects of the tokens, and the software used to design them, can allow NFTs to become visible in electronic wallets and tradeable on cryptocurrency exchanges as well as other electronic platforms. This is possible because open standards provide clear, consistent, reliable, and permissioned APIs for reading and writing data. The right interoperability protocols can allow for seamless integration into virtual marketplaces - think stock exchanges, Ebay and beyond.

- **Market Size and Liquidity**

- Tradeability improves access to markets. In turn, markets increase access to buyers, thereby increasing sales volumes and liquidity. Market size and total liquidity will be key for including tokens in the largest trade platforms, such as stock and currency exchanges.

- **Decentralized Finance of DeFi**

- Decentralized Finance (DeFi) is a blockchain-based form of finance that does not rely on central financial intermediaries (such as brokerages or banks) to offer traditional financial instruments. Instead, DeFi uses smart contracts on blockchains, such as Ethereum.

- **What is a DAO?**

  https://en.wikipedia.org/wiki/Decentralized_autonomous_organization

  https://daohaus.club/

DOCUMENTS AND LINKS MENTIONED

https://pozzleplanet.substack.com/p/blockchain-the-miracleof-the-commons

https://uploads-ssl.webflow.com/5fef186f973b9b2aec20edd3/613941330625fa25b1875096_GainForest_Green_Paper.pdf

Spanish guide to tokenizing, NFT etc:

https://gk.city/2021/11/15/guia-como-funcionan-criptomonedas/

https://search.usi.ch/en/organisational-units/604/center-for-climate-finance-and-sustainability/people

https://link.springer.com/chapter/10.1007%2F978-3-030-55374-6_34

https://token-information.com/blockchain-for-africa-eco-payments-to-protect-nature-and-wildlife/

https://doi.org/10.1016/j.geoforum.2019.02.011

https://www.intrinsicexchange.com

https://docs.regen.network/modules/ecocredit/

https://www.forbes.com/sites/nisaamoils/2020/03/04/the-new-superheros-theyll-use-gaming-and-blockchain-to-solve-climate/

Projects (presented during the call)

- Alex Gordon-Brander & Peter Corke from Centree & Teratree - alex@teratree.com & pete@teratree.com
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  https://www.linkedin.com/company/letsinvert/

  https://www.linkedin.com/in/lisa-muramoto-82aa27139/

  https://letsinvert.com/

  https://opensea.io/collection/new-eden

  https://discord.gg/UtYTYZVHN6

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  https://www.gainforest.app

  https://www.linkedin.com/in/dwddao/

  https://www.youtube.com/watch?v=mvMmOHJ54ho
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https://discord.gg/zXHP7aFW

Regen Network is building the public infrastructure that will run the future of ecological health backed money.

- Kjell Clarysse - Forestbase - kjell@forestbase.io

  https://www.linkedin.com/in/kjellclarysse/

- Merit Valdsalu - Single Earth - merit@single.earth

  https://www.linkedin.com/in/merit-valdsalu/

Projects UNPRESENTED

- Moss.Earth https://moss.earth
- Tupan https://www.tupan.io
- Seeds https://joinseeds.earth
- Open Forest Protocol https://www.openforestprotocol.org

POINTS OF INTEREST

- Inventory of different instruments and business models information
- Key bottlenecks that limit development and scaling
- Chief “early coordination” strategies that can ease market access

- Market and product description
- Source market assessment and relation to local population
- For-Profit or Non-Profit models
- Credibility and accountability (certifications, etc.)
- Protocols and use of market conformation standards
- Size at startup and future ambitions

- Should we launch a joint regenerative currency, together?
- Next steps as a group and sector