



The Kolektivo Framework

Regenerative Finance at Institutional Scale

*A collaboration between Kolektivo Labs & Curve Labs
with support from The Regenerative Finance Foundation*

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The Kolektivo Framework is a collection of institutional technologies that allow local communities to launch, finance, and govern their own regenerative economies.

Kolektivo will launch a first community economy on the island of Curaçao in late 2022.



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Acronyms

AMM	Automated Market Maker
ANG	Netherlands Antillean Guilder
BAC	Badger Access Control
BCT	Toucan Protocol Base Carbon Tonne
DAO	Decentralized Autonomous Organization
DeFi	Decentralized Finance
GeoNFT	Geospatial Non-fungible Token
LETS	Local Exchange Trading System
LP	Liquidity Pool
MRV	Monitoring, Reporting, and Verification
Multisig	Multisignature Wallet
P2P	Peer-to-peer
PES	Payments for Ecosystem Services
ReFi	Regenerative Finance
RWA	Real-world Asset
kCUR	Kolektivo Curaçao Reserve Token
kG, kGuilder	Kolektivo Guilder
KNT	Kolektivo Network Token
KTT	Kolektivo Treasury Token
KYC/AML	Know Your Customer / Anti-Money Laundering
SES	Socioecological System
Web3	The Decentralized Web



Executive Summary



The challenges of the 21st century — such as climate change and financial crises — require new tools that help local communities to be naturally adaptive, antifragile and competitive against global forces. The Kolektivo Framework is a collection of institutional¹ technologies that allow local communities to govern and finance themselves. Kolektivo offers a regenerative² alternative to serve local communities and ecosystems underserved or harmed in the present-day.

Using the framework, communities can create and leverage new types of assets and monies to advance their economies based on environmental stewardship, innovation, and social impact. Kolektivo enables communities to assign self-sovereign roles and responsibilities to their own stewards and leaders, who in turn issue economic policies and divert funding towards community-identified causes.

The Kolektivo Network, a global coalition of innovators, impact funders, and environmental stewards, will support and launch the first community economy on the island of Curaçao in late 2022. This community economy will demonstrate the framework's general viability, and specifically demonstrate that sustainable food forest tokens — a new type of ecological asset based on regenerative agroforestry³ — can back kGuilder, the community currency.

Kolektivo Curaçao's practical learnings will be used to iterate on the framework and expand the network to community economies all around the world. Each community economy will produce their own ecological assets to both back themselves and support the Kolektivo Network as a whole.

1 "Institutions are humanly devised structures of rules and norms that shape and constrain individual behavior." ([Wikipedia](#))

2 "The term "regenerative" describes processes that restore, renew or revitalize their own sources of energy and materials. Regenerative design uses whole systems thinking to create resilient and equitable systems that integrate the needs of society with the integrity of nature." ([Wikipedia](#))

3 "Agroforestry is a land use management system in which trees or shrubs are grown around or among crops or pastureland. Trees produce a wide range of useful and marketable products from fruits/nuts, medicines, wood products, etc." ([Wikipedia](#))



The Big Picture

Economy

Society

Environment

Graphic adapted from "Ecological Economics," [Wikipedia](#)

“Blockchain-based coordination may enable new types of economic activity that were previously not able to be governed by firms, markets, or governments... bringing economic coordination and governance institutions to spaces that are currently either poorly served or not served at all by extant coordination mechanisms... it is an institutional technology.”

– Davidson, De Filippi, and Potts⁴

Today, large institutions such as states and transnational corporations operate in a global economic order defined by open markets and financialization — a process in which exchange occurs through financial products instead of tangible goods and services. In this order, local institutions and the environment tend to be marginalized in support of global capital. In practice, at the local level, this often causes rural displacement, unsustainable territorial management, high levels of foreign ownership, and diminished self-sovereignty⁵. These factors reduce the capacity for local institutions to adapt to the increasing frequency and volatility of global environmental, social, and economic turbulence, such as the ongoing climate crisis. Small island states, such as Curaçao, are especially susceptible to these plural crises, and are in dire need of new institutions to navigate them.

Under the hypothesis that both mitigation and adaptation⁶ to crisis will be the main drivers of value redistribution in the upcoming decades, there is a strategic need to revisit bottom-up institutional design. A multitude of technical, cultural, and governance innovations are needed to create or retrofit existing institutions towards this new paradigm. While many global-spanning institutions are proactively researching and anticipating these changes in order to formulate appropriate policies, the economic value their policies generate often fail to translate into meaningful action at a local level or return value to the value creators.

⁴ Davidson, Sinclair, De Filippi, Primavera & Potts, Jason (2018). [Blockchains and the Economic Institutions of Capitalism](#)

⁵ “Sovereignty is the defining authority within an individual consciousness, social construct or territory.” [Wikipedia](#)

⁶ “An adaptive system is a set of interacting or interdependent entities, real or abstract, forming an integrated whole that together are able to respond to environmental changes or changes in the interacting parts...” [Wikipedia](#)



The Kolektivo Framework affords new institutional capabilities through ecological asset formation and the governance of ecological asset markets. Kolektivo streamlines coordination between global and local institutional actors that share the same social values and environmental goals. The introduction of these capabilities adjusts the institutional environment to the benefit of local, embodied life, while still reducing transaction costs between participating actors.⁷

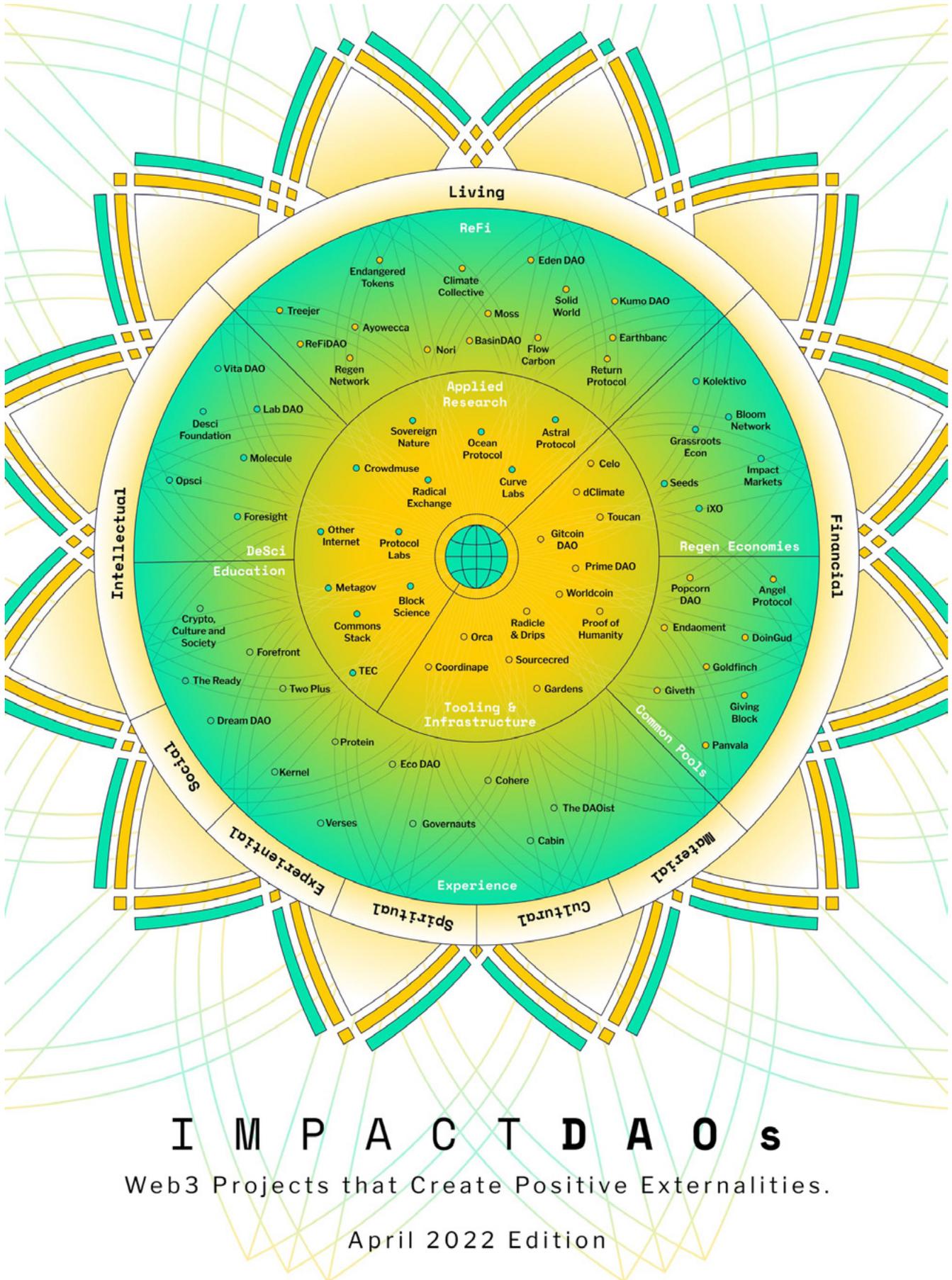
The emerging Web3 Regenerative Finance (ReFi) sector aims to use Web3 tooling to support the development and maintenance of institutions that benefit human and non-human life. ReFi is working towards embedding finance within the underlying social and ecological realities in which economies exist. ReFi tooling covers many use cases, including:

- **Coordination tools** that streamline matchmaking between labor, capital, and eco-entrepreneurs in support of social and environmental impact. Governance tooling is the most important member of this category, with programmable organizations offering great flexibility to design and automate new types of blockchain-native organizations with their own social choice mechanisms. These programmable organizations are colloquially referred to as [DAOs](#).⁸
- **Economic and financial tools** that optimize market liquidity, transparency, and access. In particular, the rise of decentralized finance (DeFi) has helped eliminate economic intermediaries and improve the availability of finance all around the world. ReFi builds on this momentum by expanding the range of programmable assets that can conceivably exist, such as ecological tokens whose properties are contingent on the ecological state of our underlying material reality.
- **Data management tools** that improve the measurement, reporting, verification, storage, and monetization of ecological state or change of state.

⁷ "[A] transaction cost is a cost in making any economic trade when participating in a market... institutions, understood as the set of rules in a society, are key in the determination of transaction costs." ([Wikipedia](#))

⁸ See "[A Prehistory of DAOs](#)" Kreutler (2021) for subject background.





IMPACTDAOs

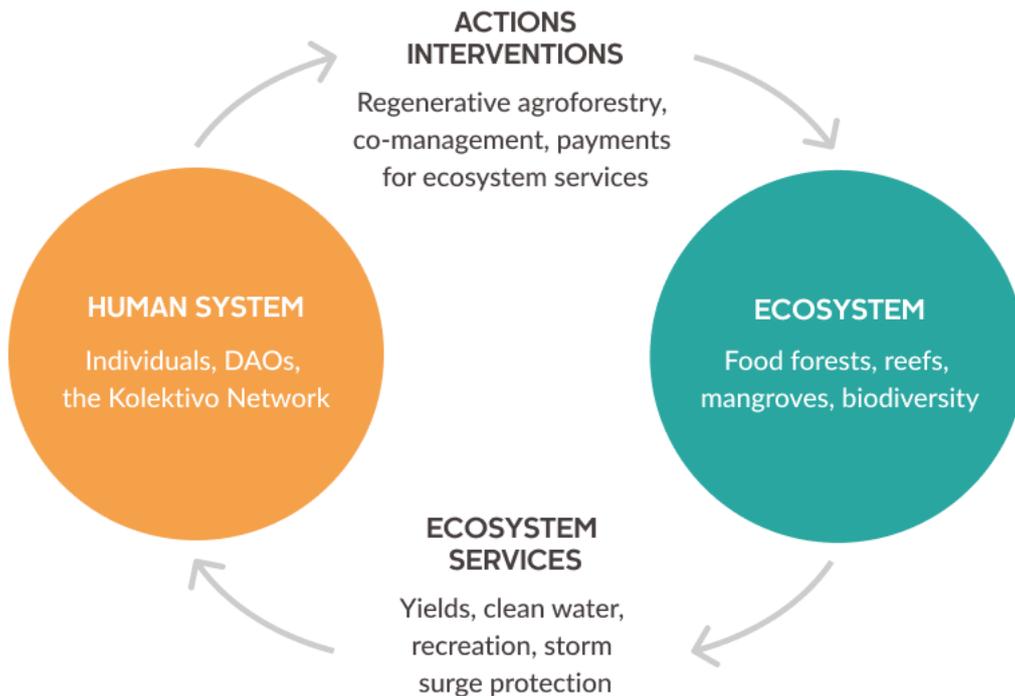
Web3 Projects that Create Positive Externalities.

April 2022 Edition

The [ImpactDAO map](#), produced April 2022 with support from the Gitcoin DAO, provides a fairly comprehensive overview of Web3 actors either working in or adjacent to the emerging ReFi sector.



Kolektivo's Value Proposition



The Kolektivo Framework, as a collection of institutional technologies, supports good governance of socio-ecological systems.⁹

The ReFi and DAO sectors have reached notable levels of maturity and recognition both interior and exterior to Web3; however, many of the objectives of actors in both sectors are broadly aimed at retrofitting or participating in existing market structures. While these efforts are needed, Kolektivo approaches the institutional ReFi gap by designing its own market structures of a bottom-up, local to global character, where the financialization of ecological state primarily benefits the local institutions that upkeep said state. To this end, Kolektivo is made up of a suite of institutional technologies and communities that want to capitalize on the value they already create, relocalizing finance to the benefit of life.

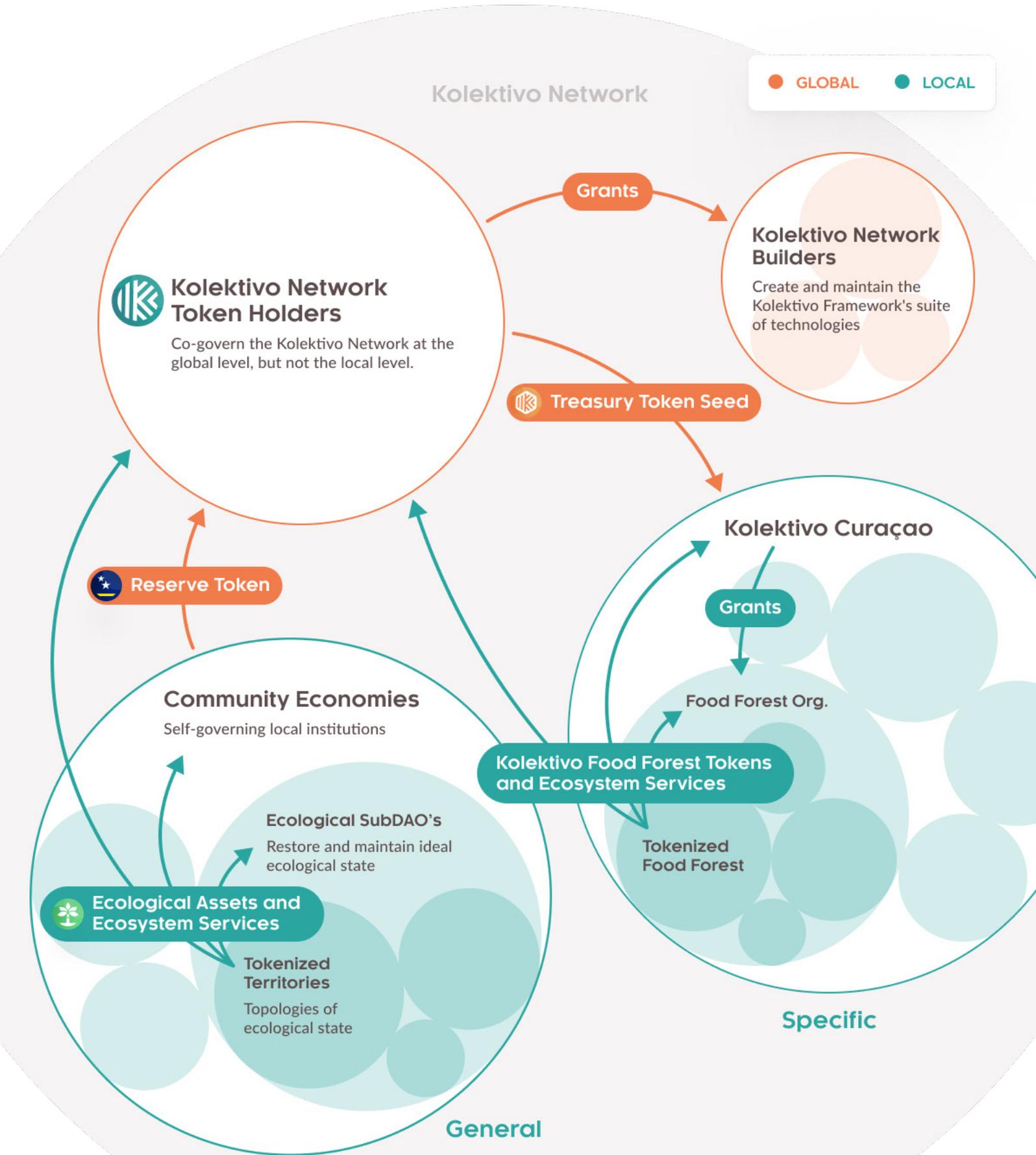
Kolektivo is primarily born of a close and long-standing collaboration between [Kolektivo Labs](#) and [Curve Labs](#), with contributions from many other forward-thinking Web3 and nonprofit entities, and consists of many moving parts:

- **The Kolektivo Framework** combines the latest digital innovations for a new type of socioecological institution: the community economy.
- **The Kolektivo MVP**, building on three years of pilot experimentation, formally launches the first community economy in Curaçao in Q4, 2022.
- Following the MVP, Kolektivo will scale a network of community economies worldwide, backed by the ecological assets they create: **The Kolektivo Network**.

⁹ "A social-ecological system consists of 'a bio-geo-physical' unit and its associated social actors and institutions. Social-ecological systems are complex and adaptive and delimited by spatial or functional boundaries surrounding particular ecosystems and their context problems." ([Wikipedia](#))



Stakeholders of the Kolektivo Network



One of Kolektivo's key objectives is to improve coordination between global and local actors. In return for seed funding issued from the Kolektivo Network's Treasury through its governance, community economies such as Kolektivo Curaçao develop regenerative territorial practices and produce corresponding ecological assets, of which some part is gifted to the Network Treasury.



Timeline and History of the Kolektivo Network

2018



The Caribbean Blockchain Network receives a research grant evaluating Decentralized Governance for Small-Nation States.

2019



The Caribbean Blockchain Network presents at Innovation Ç, a yearly Curaçao innovation festival; attendees include the Prime Minister and CuraDAO co-founders. Shortly thereafter, the [CuraDAO launches](#), a first-of-its-kind real-world DAO experiment.

2020



[CuraDAI launches](#), a community currency governed by CuraDAO; the DAO finances its first regenerative food forest, trading CuraDAI for yield. Kolektivo is conceived of and wins the Kickstart Innovation, a yearly contest by the Curaçao Ministry of Economic Development.



MakerDAO issues an R&D grant supporting CuraDAI. CuraDAO plants its second regenerative food forest.

2021



[Kolektivo Labs](#) is founded, providing systems design and technological support to Kolektivo. CuraDAO is sunsetted and becomes Kolektivo Curaçao. The CuraDAI wallet launches on the Fuse network with 300+ users and 25+ merchants in the first month. A third food forest is funded through an [NFT-fundraiser](#). In partnership with [Curve Labs](#), the [Kolektivo Framework Whitepaper](#) is published, establishing a framework for Web3 regenerative economies.



The Celo Foundation issues a development grant to accelerate the Kolektivo Framework and advance a Kolektivo Curaçao MVP. Astral Protocol and Byterocket join the project. Project members join the [Celo Climate Collective](#) to collaborate on Web3 climate action.

2022



Project members meet for an on-site in Curaçao to design the MVP. [Zed Labs](#) joins, developing the Kolektivo Wallet. The Kolektivo MVP, set to launch October 2022, is announced as a keynote at Celo Connect 2022.

YOU ARE
HERE



The Kolektivo MVP soft launches its Curaçao pilot on Celo. The Kolektivo Festival takes place October 21-22 to celebrate the launch and test the MVP. Members of the Regenerative Finance movement are invited to Curaçao to speak and share their work. \$2m is raised in a seed round to support the continued development of the Kolektivo Framework.

2023



The Kolektivo Network launches alongside the Kolektivo Network Token (KNT), iterating on the Kolektivo Framework and providing launch support to up to four community economies on Celo in 2023. Post-MVP modules are developed, such as parametric ecological insurance.





Platform Technologies

The Kolektivo MVP broadly consists of four technological categories: monetary, ecological, governance, and payments.¹⁰ The Network’s R&D entities – the “Kolektivo Network Builders” – collectively work towards the development, integration, and optimization of these technologies:

Monetary



Local Reserve and Token

Standard supply and liquidity functions – e.g. bond issuance.



Community Currency

A parallel currency pegged to the local money for day-to-day spending.

Governance



Badges

Customizable NFTs that assign permissions or are purely cosmetic.



Grants

A straightforward grant signaling, application, and issuance interface.

Payments



Kolektivo Wallet

A mobile application for quick and easy payments. Includes a local merchant list, community feed, and crypto swap mechanism.

Ecological



The Impact Map

An interface for tokenizing, validating, and monetizing ecological state. Coordinates conservation and restoration work.



Parametric Insurance

A post-MVP module that automates environmental upkeep by underwriting systemic risk.

¹⁰ These categories approximately map to the subsystems of the original [Kolektivo Framework Whitepaper](#): monetary, governance, natural capital, and registry. They are not perfectly mapped, as any natural language specification such as the whitepaper is subject to practical interpretation depending on implementation scope or maturity of industry solutions.

Monetary



The **Kolektivo Network Token (KNT)** bridges liquidity between trading pairs and community economies in Kolektivo's broader ecosystem. It ultimately facilitates exchange between the many assets that the Kolektivo Framework will produce and support, such as ecological assets, community currencies, and local reserve tokens. KNT affords certain network governance rights.



The **Kolektivo Treasury Token (KTT)** is used to bootstrap local reserves and their corresponding community economies. It is an elastic supply token based on the total value of assets in the Kolektivo Network Treasury. For example, if there are \$100m worth of assets in the Treasury, and KTT aims to be priced at \$1, then its supply will change — what is known as rebasing — to 100m.



The **Kolektivo Curacao Reserve Token (kCUR)** is used as collateral in the Mento system to mint the community currency. It is backed by the Reserve's assets, such as KTT, Ecological Tokens or LP Tokens. kCUR's parameters, such as leverage, price ceilings and floors, are customizable through community governance.



The **Kolektivo Guilder (kG)** is the community currency of Kolektivo Curaçao, used by the Curaçaoan population for daily exchange. kG is pegged to the national fiat currency (Guilder) and collateralized by kCUR in the Mento system.



Ecological Tokens are fungible shards of a Geospatial Non-Fungible Token. A shard is produced when an NFT is split into multiple tokens. Ecological tokens are a key asset class backing community reserves and currencies. Ecological tokens have four potential use cases that bind them to the territories they represent: as datatokens, insurance tokens, outputs-rights tokens, and ownership tokens. Some of their market characteristics such as supply are correlated to topological or ecological parameters, linking these tokens to the underlying material reality.



Liquidity Pool Tokens (LP Tokens) are a representation of the existing assets in a Liquidity Pool — a sort of index with member tokens. LP Tokens are issued to liquidity providers in exchange for their participation in the liquidity pool. For example, a liquidity provider who deposits KNT and kCUR in a two-asset pool will generally receive [50% KNT / 50% kCUR] LP Tokens proportional to their share of the pool, as well as a proportional distribution of trading fees collected by the pool.





Kolektivo's MVP monetary technologies primarily concern the interactions between a family of tokens (previous) and two monetary entities: the **Kolektivo Network Treasury**, and the **Kolektivo Curaçao Reserve**.

The Kolektivo Network Treasury

The Kolektivo Network Treasury is globally unique, with only one existing. It is governed by Kolektivo Network Token (KNT) holders. From it, seed financing is distributed to incubate Kolektivo's community economies and the corresponding production of ecological assets.

The Treasury is expected to hold its native token, KNT, as well as ecological assets. From the aggregate value of these tokens, the treasury creates the Kolektivo Treasury Token (KTT): a direct representation of the treasury's value. KTT rebases to keep some ratio (e.g., 1 KTT \approx \$1 of treasury assets). In general, KTT is not widely available on the secondary market. Technically, it can be seen as a receipt token, as 1 KTT will always represent and grant access to \$1 worth of treasury assets, just like a receipt.

What is rebasing?

Rebasing tokens (or elastic supply tokens) algorithmically adjust their supply to reflect important changes, mostly price-related. Similar to stablecoins, rebasing tokens are often pegged to certain fixed values or other currencies, like \$1. If for example a token's underlying value grew by 10%, the next rebase would adjust the supply accordingly, increasing it by 10%. A user holding 10 tokens prior to this rebase would then hold 11 tokens afterwards.

The Kolektivo Curaçao Reserve

The Kolektivo Curaçao Reserve is the monetary entity of the MVP's community economy. It includes certain features such as **leverage** and **floor/ceiling pricing mechanisms**. Its corresponding token is the Kolektivo Curaçao Reserve Token (kCUR), a standard non-rebasing token.¹¹ Each community economy is expected to have its own reserve with its own Reserve Token, however, the Framework's modularity at the Reserve level permits it to be substituted by other monetary designs.

- **Leverage** is increased by minting more kCUR without any additional assets deposited into the Reserve. Traditionally, leverage refers to using borrowed capital as a funding source to increase one's position in a financial trade. Similarly, creating more kCUR tokens without an increase in the underlying Reserve's valuation increases a leverage ratio. The leverage ratio has a governable limit. When the leverage ratio is >1.0 , the Reserve is partially backed or fractional, for these reasons, a limit <1.0 is recommended.¹²
- **Price Floors:** One can calculate the intrinsic value of one kCUR token by summing the value of all Reserve assets and dividing this value by kCUR's total supply; this is kCUR's price floor. On the secondary market, the price should not fall lower than this floor. If kCUR is at or under the floor, the Reserve may sell assets directly to users of the community economy, returning it to its intrinsic value.

¹¹ As the Kolektivo Reserve is built on the ideas of previous reserves tested in DeFi, such as OlympusDAO and TempleDAO, it is natural to assume that the kCUR token would also rebase. Removing the rebasing mechanic reduces the technical complexity, UX overhead, and associated risks, improving the overall safety. Furthermore, rebasing is not needed, as the supply is steered and adjusted by mint and burn mechanics.

¹² For reference: Curaçao's native currency, the Guilder, is only backed by 19% USD reserves: a leverage ratio of ~ 5.26 .



- **Price Ceilings** are a complementary mechanism to floors to ensure kCUR will not experience unreasonable growth in its price beyond the productive capacity of the community economy. The ceiling can be understood in two ways: as a hard cap on the amount of kCUR that can be minted, or a price threshold, after which further growth is dampened by minting and selling new kCUR from the Reserve.

The floor and ceiling mechanisms are enforced through the implementation of a custom proxy contract that interacts with a regular automated market maker (AMM) pool.¹³ Secondary market traders can choose not to use the proxy contract pool, but are incentivized to do so due to better rates, especially at or below the floor.

The Ceiling Dampening Mechanism

If kCUR's price is above the ceiling, a trade with the proxy contract's pool behaves like so:

- User wants to exchange 10 CELO for 100 kCUR, but kCUR price is over the ceiling
- The proxy splits the trade: only 20% of the kCUR comes from the pool, and 80% is minted by the Reserve.
- The pool received 10 CELO while only releasing 20 kCUR, so the price rises only 45% of what it would have, if all 100 kCUR came from the pool.
- Why 45%? Assume the pool has 100 kCUR and 100 CELO:

Regular Trade:

User buys 10 kCUR for 10 CELO; the pool is now 90 kCUR / 110 CELO.

Price of kCUR = 1.22 CELO. Price grew by 22%

Proxy Trade:

User buys 10 kCUR for 10 CELO; the pool sends 20%; the pool is now 98 kCUR / 110 CELO.

Price of kCUR = 1.12 CELO. Price grew by 12%

- **Conclusion:** Price grew by 12% instead of 22%, 45% less than a regular trade.

Mento

To mint the community currency, the Reserve uses a version of the well-tested [Mento system by Celo](#).¹⁴ For the MVP, kCUR serves as Mento's collateral, minting kGuilder (kG), which is pegged to the Netherlands Antillean guilder (ANG) – the currency of Curaçao.

Mento's stability mechanism works such that if 1 kG is valued below 1 ANG, users can burn 1 kG (worth e.g., 0.9 ANG) to obtain kCUR worth 1 ANG, which when sold on the market for 1 ANG, earns a slight profit. Due to this, the supply of kG is reduced, bringing the price up to 1 ANG again; inversely if kG is valued above ANG, users mint 1 kG by depositing 1 ANG worth of kCUR, market selling the resulting kG to earn a profit.¹⁵

13 "Automated market makers... allow digital assets to be traded in a permissionless and automatic way by using liquidity pools rather than a traditional market of buyers and sellers. AMM users supply liquidity pools with crypto tokens, whose prices are determined by a constant mathematical formula." ([Gemini](#))

14 Algorithmic stablecoins – even those fully backed by highly liquid collaterals, such as USDC – have come under recent scrutiny due to the [collapse of the Terra stablecoin](#). Kolektivo avoids stablecoin failure modes by limiting through its ceiling mechanisms both the price and quantity of circulating kCUR, Mento's collateral for minting kGuilder. Limits should approximate the productive capacity of the community economy; that is, kGuilder money supply should not be minted in excess of the local circuits of exchange and production it facilitates

15 For a technical specification of Mento's algorithm and parameters, see "[An Analysis of the Stability Characteristics of Celo](#)" cLabs (2021).



Treasury Grants

Kolektivo Ecosystem Treasury

A network-wide treasury funding a distributed global community of technological innovators and local impact experts.

Treasury Oracle

An oracle that adjusts Kolektivo Treasury Token's supply based on the current valuation of the treasury.

Elastic tokens are tokens that adjust their supply based on some input.



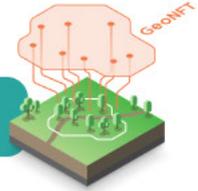
Kolektivo Treasury Token (KTT)

An elastic supply token used to bootstrap local reserves and their corresponding community economies.

Ecological Assets

Material Reality

Kolektivo Curaçao tokenizes a territorial area as a GeoNFT.



GeoNFT

The GeoNFT contains topological data referencing some geo-coordinate or territory. It points to a database where its ecological state data is stored.

The process of dividing an NFT into many tokens is called fractionalization.



Fractionalizer (Ecological Tokens)

Tokens fractionalized from GeoNFTs. Their market characteristics, such as supply, are responsive to changing topological or ecological properties.

Liquidity Pool Tokens (LP Tokens)

Ecological tokens and KTT can be deposited to liquidity pools to produce LP Tokens – a sort of token index.

Kolektivo Ecological, KTT, and LP Tokens are all deposited to the Reserve to back the issuance of the community currency.

Reserve Asset Sources

Curaçao Reserve

Kolektivo Curaçao Reserve

A local reserve complete with standard supply and liquidity functions - e.g. bond issuance. Can set monetary policies for its Reserve Token.

Proxy Contract

A special mechanism that helps provide price stability to kCUR through monetary policy.



Kolektivo Curaçao Reserve Token (kCUR)

The native token of Kolektivo Curaçao, backed by the Reserve's assets.

Community Currency

Mento System

Mento uses a single collateral to create community currencies. For Kolektivo Curaçao, Mento uses kCUR to issue community currency.

For every \$1 worth of kCUR deposited into Mento, \$1 worth of Kolektivo Guilder is created, and vice versa.



Kolektivo Guilder (kG)

The community currency of Kolektivo Curaçao.

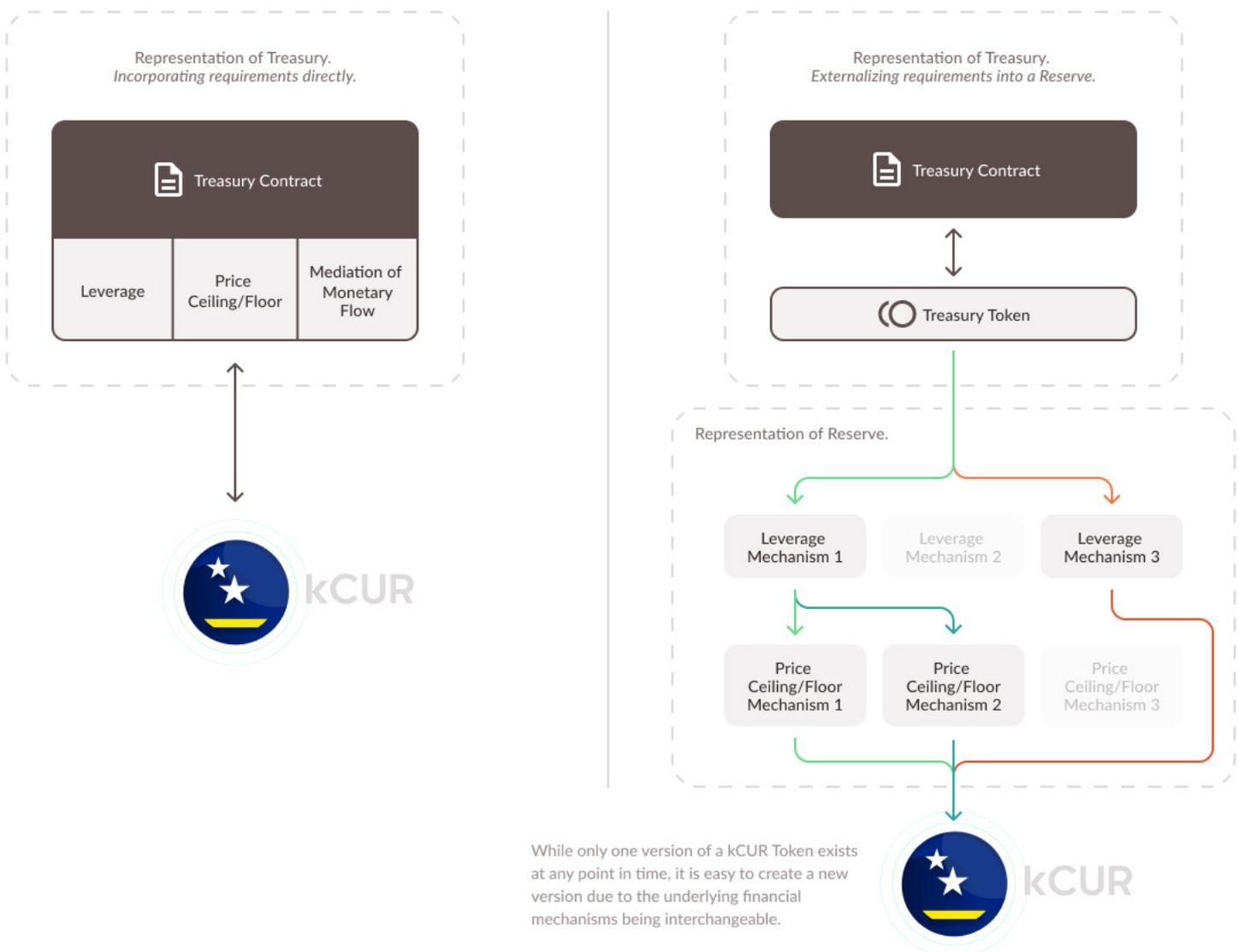


Safety Bias

The use of KTT and the separation of the Network Treasury from its constituent Reserves ultimately improves the modularity, security, and interoperability of the Framework as a whole.

Assume the Treasury holds a mixture of different tokens with a governance mechanism in place for the Kolektivo Network to make decisions about these tokens. The question arises of how the Treasury can be incorporated into DeFi. At this point, the Treasury is just a non-standard smart contract with an unknown amount of value in it. There is yet no representation of the Treasury following ERC20¹⁶ standards as such and therefore DeFi's composable nature is not accessible.

An ERC20 token representing the Treasury is needed. However, should this ERC20 token be 1:1 mappable to the treasury, i.e., a structure-preserving representation, or should this token directly incorporate the Reserve's leverage and ceiling/floor mechanisms? Visualize two architectures:



16 "The ERC-20 introduces a standard for Fungible Tokens, in other words, they have a property that makes each Token be exactly the same (in type and value) as another Token." ([Ethereum Docs](#))



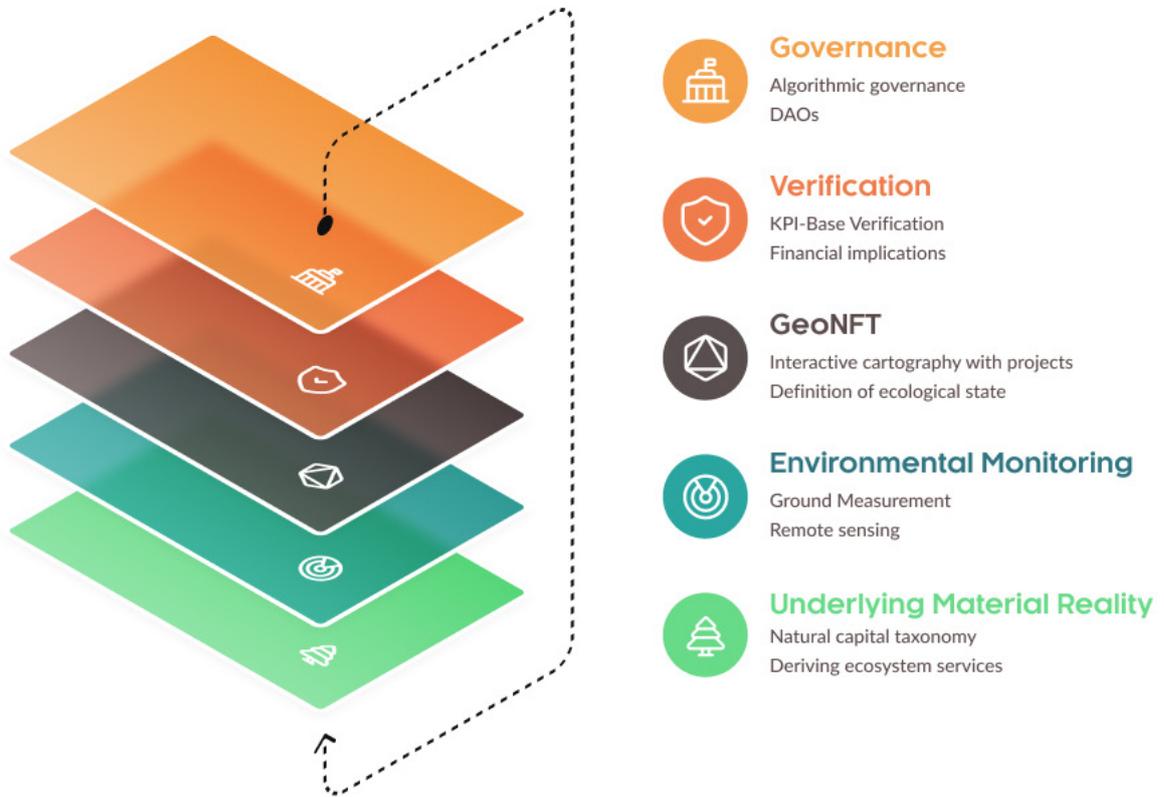
- The **right-hand architecture** shows Kolektivo's MVP, where an intermediary token, KTT, is a structure-preserving representation of the Treasury. It incorporates monetary requirements such as leverage on top of that token through the addition of the Reserve Token, kCUR. This strongly mitigates technical risk, as a key issue arises if one of the Reserve's mechanisms or the kCUR token fails.
- The **left-hand architecture** has no such direct representation of the Treasury. The kCUR token produced obscures Treasury value through leverage and ceiling/floor mechanisms. Each DeFi protocol integrating kCUR tokens also integrate these built-in requirements to their respective protocols. DeFi protocols would be rightfully hesitant to integrate such a token. Due to the strong coupling of kCUR token to the treasury contract (in this example), one technical failure could lead to the whole Treasury being drained. This is unacceptable in the context of a real-world user community whose livelihoods may depend on system reliability. It is worth noting that this separation of risk also enables Kolektivo to experiment with various systems with less value at stake. Instead of wholly committing to the bespoke Kolektivo Reserve MVP implementation, a Reserve may pivot to a MakerDAO style vault;¹⁷ alternatively, two Reserves could exist simultaneously.

In addition to these risk averse optimizations in the smart contract architecture, an advanced risk dashboard for both Treasury and Reserve managers is in development.

¹⁷ A vault in MakerDAO's system allows a user to generate a stablecoin by depositing a defined collateral, similar to Mento. See [MakerDAO's community portal](#) for more information.



Ecological



Kolektivo rejects the free-market thesis which states that any good or service finds its fair value in an unconstrained market. Instead, Kolektivo follows the [ecological economic](#) argument that the price signal of fiat currencies generally fails to account for negative externalities, excluding the value of ecological assets¹⁸ and ecosystem services.¹⁹ By their nature as common goods,²⁰ ecological assets struggle to incentivize human agents to conserve, restore, and manage them.

Financing for ecosystem services is required, such as well known [Payments for Ecosystem Services](#) (PES) schemes. With an estimated USD value of all services being in the trillions USD,²¹ and global crises requiring large-scale institutional adaptation, it is clear a new eco-financial sector is being forcibly incubated. A growing number of studies prove the potential of PES to fight against ecosystem degradation,²² not only from a global,²³ but also a local point of view²⁴ — especially when PES flows to indigenous populations.²⁵

18 Wainaina, Priscilla, et al. (2022). [Negative Environmental Externalities Within Cocoa, Coffee And Oil Palm Value Chains in Africa.](#)
 19 "Ecosystem services are the many and varied benefits to humans provided by the natural environment and from healthy ecosystems." ([Wikipedia](#))
 20 "Common goods are defined in economics as goods that are rivalrous and non-excludable... Wild fish are an example of common goods. They are non-excludable, as it is impossible to prevent people from catching fish. They are, however, rivalrous, as the same fish cannot be caught more than once." ([Wikipedia](#))
 21 Costanza, Robert, et al. (1997). [The Value of the World's Ecosystem Services and Capital](#)
 22 Jayachandran, Seema, et al. (2016). [Cash for Carbon: A Randomized Controlled Trial of Payment for Ecosystem Services to Reduce Deforestation](#)
 23 Alix-Garcia, Jennifer M., et al. (2012). [Forest Conservation and Slippage: Evidence from Mexico's National Payment for Ecosystem Services Program](#)
 24 Honey-Roses, Jordi., et al. (2011). [A Spatially Explicit Estimate of Avoided Forest Loss](#)
 25 Busch, Jonah & Ferretti-Gallon, Kalifi (2017). [What Drives Deforestation and What Stops It? A Meta-Analysis](#)



By introducing local monetary governance where ecological assets can be minted, governed, and collateralized, the Kolektivo Framework radically alters the market structure and constituent price signals determining ecological asset value. Whereas PES is generally constrained by top-down funding mechanisms, Kolektivo faces no such constraints, as it aims to back local money supply through tokenization of the underlying material reality. This method supersedes PES by economically interiorizing and relocalizing the production of ecological capital.

Whereas globalization tends to exclude local communities from the benefits they already produce for themselves, trapping them in a negative feedback loop, Kolektivo aims to provide a way out of this system through locally endogenous collateral production of those ecological assets undervalued today. Kolektivo's key hypothesis is that by assigning the correct value to ecological assets, they will be more attractive to labor, capital, and eco-entrepreneurs, inverting this negative feedback loop into a positive one.

Decentralizing MRV

Measurement, Reporting and Verification (MRV) refers to the integration of three processes: monitoring, reporting, and verification of data mostly relating to climate change – e.g., data on greenhouse gas emissions. Although MRV is central to preventing environmental degradation, many issues exist and improvements are possible:

- **Many institutions, such as nations, incorrectly report their greenhouse gas emissions.**²⁶ Programs like the UN's REDD+, which reward avoided carbon emissions, require effective MRV due to their results-based architecture, yet MRV results lack the transparency required. To this end, [REDD+](#) has thus far largely failed to improve our underlying material reality.²⁷
- **Certain low-effort high-reward conservation initiatives are not included in key institutional payment programmes.** The well-known [Clean Development Mechanism](#) of the UN refuses to integrate “avoided deforestation” into its methodology because MRV cannot effectively measure corresponding reductions – even though this number may make up 18-25% of global emissions reduction.²⁸
- **It is difficult to integrate MRV methodologies and data across multiple institutional actors and scales.**²⁹ The heterogeneity of the techniques used globally, nationally and locally highlight the lack of a common baseline and interoperable data ecology.
- **Institutional incentives programs like REDD+ have thus far failed to scale a sustainable planetary-scale financing mechanism.**³⁰ Incentives to monitor, protect, and restore areas with high ecological potential still fall drastically short of what is necessary to mitigate the climate crisis.
- **A recent report highlights the absence of clear local roles, responsibilities, and decentralized data collection as overarching MRV flaws.**³¹

26 Swart, Rob, et al. (2011). [Are national greenhouse gas emissions reports scientifically valid?](#)

27 Clouse, Carol J. (2020). [The U.N.'s Grand Plan to Save Forests Hasn't Worked, But Some Still Believe It Can](#)

28 Stern (2006). [Stern Review: the Economics of Climate Change](#)

29 Korhonen-Kurki, K., et al. (2013). [Multiple levels and multiple challenges for measurement, reporting and verification of REDD+](#)

30 Clouse, Carol J. (2020). [The UN's Grand Plan To Save Forests Hasn't Worked, But Some Still Believe It Can](#)

31 Carreno, Cesar, et al. (2021). [Typical Challenges for Vertically Integrated Measurement, Reporting and Verification Systems of Greenhouse Gas Emissions](#)



The Kolektivo Framework fully understands these underlying institutional coordination and finance failures, linking MRV's current ineffectiveness to the lack of agency it provides to those communities MRV concerns.

According to Ostrom's Principles for managing the commons, the populations directly benefiting from a common good must take part in the decisions concerning it.³² When MRV is conducted by local participants who benefit the most from its activities, and assign to themselves the value that it creates, the adoption of effective MRV practices increases, as well as the odds for long-term socioecological success.

Through ecological asset formation, Kolektivo cycles the majority of the value produced by the community to the community – where it belongs. Kolektivo flips traditional MRV on its head, making a traditionally top-down process bottom-up. Ultimately, MRV decentralization will only occur when a network of socioecological institutions populate the physical while simultaneously virtually interoperating with Web3.

Monetizing Ecological Assets

At the heart of Kolektivo's approach to ecological assets is the Geospatial Non-Fungible Token (GeoNFT), which aims to be a faithful digital twin of the underlying physical reality. It is a non-fungible token consisting of topological data, such as geometric collections of areas, linestrings, or points. It includes a centralized or decentralized identifier (CID/DID) pointing to a datastore of the ecological state data for its constituent territory. GeoNFT borders can be computationally defined – e.g., the boundary of an area of a certain level of forestation – or manually determined through the local governance of a geographic expert.

Following from the GeoNFT are ecological tokens: fungible ERC20 tokens split from the GeoNFT through a process known as fractionalization – the act of dividing a NFT into multiple fractions, or shards. As discussed previously, these ecological tokens can be both...

- **Collateral** in local reserves, such as the Kolektivo Curaçao Reserve for community currency production, or global reserves, such as the Celo Reserve³³ for Celo stablecoin production.
- **Treasury assets**, materially backing the wealth of the Kolektivo Network and KTT to seed new community economies all around the world.

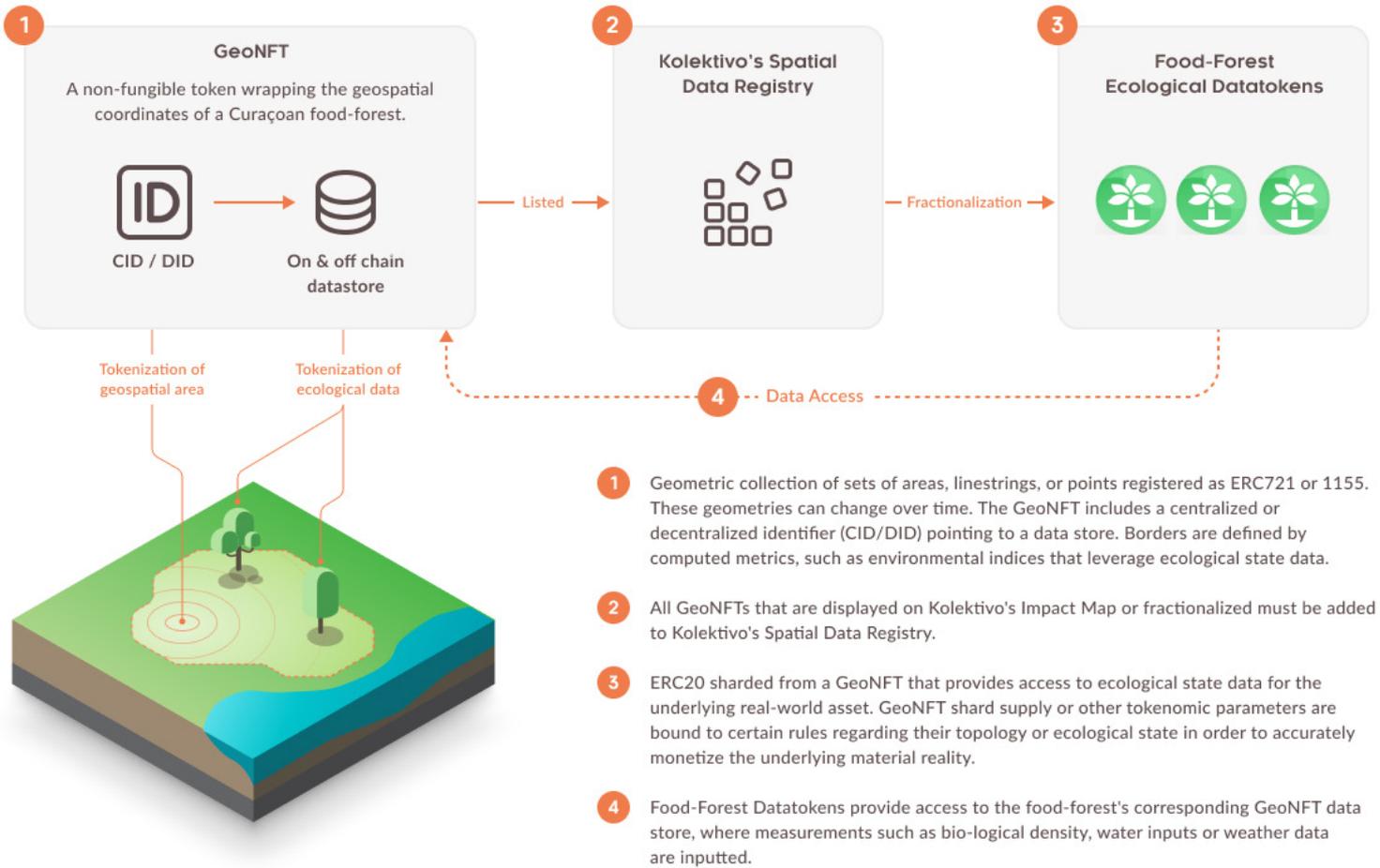
Beyond their role as collateral and treasury assets, though, there are four means of monetizing and binding ecological assets to our underlying material reality: as **datatokens**, **outputs-rights tokens**, **insurance tokens**, and **ownership tokens**.

³² Ostrom, Elinor (1990). [Governing the Commons. The Evolution of Institutions for Collective Action](#)

³³ See <https://reserve.mento.org/> for more information.



Ecological State Datatokens



Ecological data informing an ecosystem's state is of paramount importance for ongoing management of the environment. In Kolektivo, ecological data is stored in datastores that correspond to a territory's GeoNFT. These datastores are accessible through ecological datatokens. In 2023, the [Ocean Marketplace](#) will list the first ecological state data produced by Kolektivo Curaçao's fractionalized food forest GeoNFTs. As Kolektivo grows over time, so will its ecological data quantity and quality. This data is used for many practical socioeconomic purposes:

- **Ecological simulations and model development.** For example, on a meso scale, the data collected by the [Large Carnivore Wolf-Lynx Network](#) makes it possible to forecast wolf impact on sheep populations, which improve future reintroduction prospects and the likelihood of smart policy-making.³⁴ On a macro scale, well-known climate models require high levels of data inputs, such as the [IPCC's Report on Climate Change](#).³⁵
- **Verification of research results** – proving the effectiveness of an ecological measure outside the limits of academia or the laboratory – the ecological acid test.³⁶
- **Meta-analysis** – determining overall ecological trends thanks to the analysis of research results from many independent studies and datastores.

34 Duchamp, Christophe, et al. (2004). [Le retour du loup dans les Alpes françaises](#)

35 IPCC (2022). [IPCC WGII Sixth Assessment Report](#)

36 Egan, Dave (2001). [A New Acid Test for Ecological Restoration](#)



- **Decision-making and decision support systems** – determining what agro-commodities or nature-based solutions to cultivate in some territory based on historical measurements and trajectories.
- **Ecological resource management** – understanding available ecosystem asset stocks and macro trends in production and availability.
- **Education** – helping embed and build relations between the community and their surrounding, life-giving milieu.

The market for ecological state data has grown significantly over the years. For example, in the agricultural sector, big data is used in a wide range of areas – from soil to biodiversity analysis.

- A recent study describes 34 application areas for big **agricultural data**, highlighting significant need and demand of environmental data.³⁷
- The global **environmental monitoring data** sector reached several billion USD in 2020, and is expected to double by 2030.³⁸
- While **weather and climate data** are not very valuable on their own, their value scales when aggregated or collected over time. In the US, the total value of weather data across industries³⁹ has been estimated at \$13 billion in 2017 with strong growth projections.⁴⁰

Despite the overall appetite for ecological state data of various types – agricultural, environmental monitoring, weather and climate – available datasets remain limited and siloed across actors, territories, and industries. This hampers research and impact efforts, restricting retrospective analyses to limited case studies.⁴¹ To deal with data scarcity, a growing effort is underway to advance widespread participatory data collection – data collected by volunteers, local inhabitants, and local scientists.⁴² However, due to a lack of economic incentives, these efforts are broadly hampered in adoption.

Kolektivo's approach to ecological data monetization is advantaged by its bottom-up, community collection mechanisms. In Kolektivo, ecological data benefits first and foremost *the data providers themselves* – those territorial stewards and Reserves who are the primary holders and creators of ecological tokens. Through this egalitarian approach to the ecological data economy, Kolektivo aims for widespread ecological data production.

37 Kamilaris, Andreas, et al. (2017). [A Review on the Practice of Big Data Analysis in Agriculture](#)

38 Rake, Rachita & Kumar, Vineet (2021). [Environmental Monitoring Market by Component and Applications: Global Opportunity Analysis and Industry Forecast, 2021–2030](#)

Note that market size is usually made up of the total number of potential buyers and the total revenue regenerated by the potential sales.

39 Calculated as the weather data's value proportionally reduced or augmented to the industries' sensitivity to weather.

40 National Weather Service Enterprise (2017). [Analysis Report. Findings on Changes in the Private Weather Industry](#)

41 Frey, Ulrich (2020). [Sustainable Governance of Natural Resources. Uncovering Success Patterns with Machine Learning](#)

42 Hoyer, Mark V. & Canfield Jr., Daniel E. (2021). [Volunteer-Collected Water Quality Data Can Be Used for Science and Management](#)



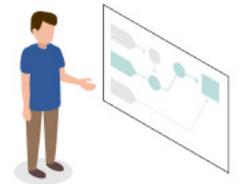
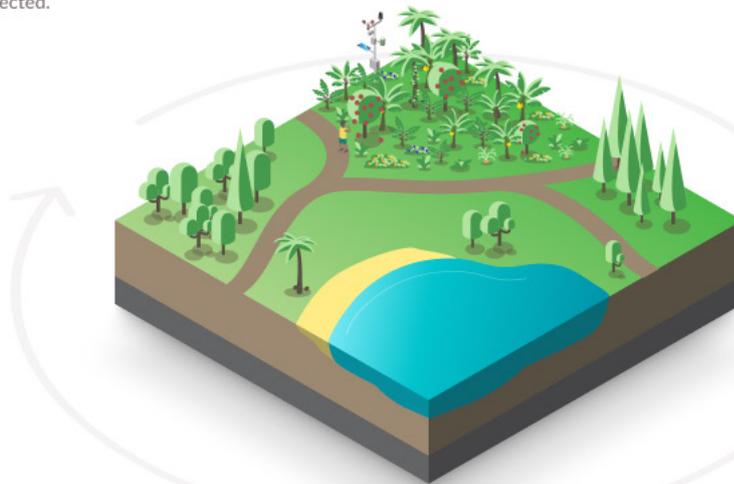
STEP 1 Data Collection

Food-forest weather data is collected with an IoT weather station. In parallel, ecological data – such as biodiversity, soil pH or moisture – is manually collected.



STEP 2 Verification

Collected ecological data is stored to the GeoNFT's database by an ecology data delegate (see governance section). This expert makes sure that data inputs are correct and reliable.



STEP 3 Data Schema

Verified data passes through a data schema and is sorted and classified. A data schema can be compared to a skeleton structure where ecological data fits in. This process unifies the shape and parameters of the collected and verified ecological data.

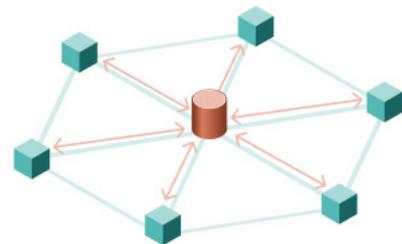
STEP 5 Data Consumption

Third parties interested in Kolektivo's food-forest data – e.g. scientists, universities, farmers, private enterprises – purchase ecological tokens for data access rights, using a Web3 data marketplace, such as the Ocean marketplace.



STEP 4 Data Storage

Where storage occurs depends on the data's nature – e.g. IPFS for GeoNFT metadata, OrbitDB for weather station data. Following storage, ecological data is available for computation or tokenomics responsive to the underlying material reality, e.g. the automation of smart contract parametric insurance or elastic supply tokenomics responsive to ecological state.



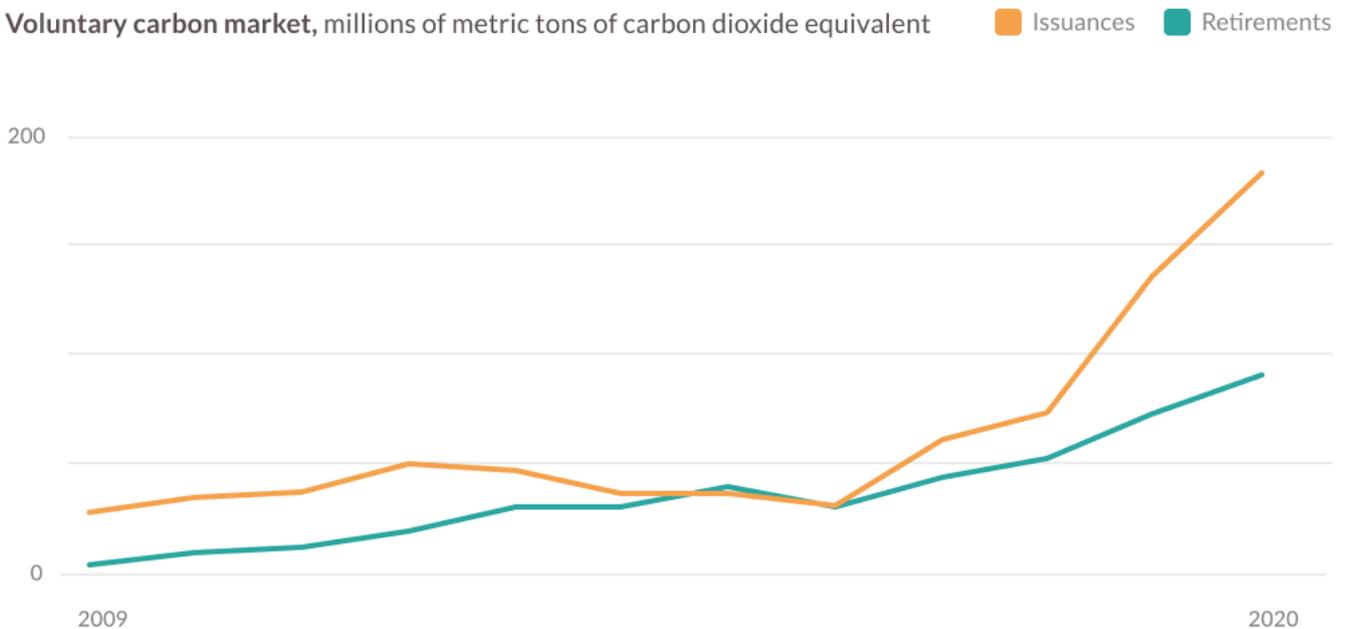


Outputs Rights: The Growing Market for Ecosystem Credits

An ecological asset output is understood as those produced assets and services valued by and useful to humans for some territory. For example, a food forest produces a wide range of outputs – from fruits, vegetables or wood, to the regeneration of the soil it occupies.

While outputs can be physical, an increasingly valued output are carbon offsets. The appetite for carbon is growing exponentially. The voluntary carbon market issued over 175m tonnes of offsets in 2020, versus 75m in 2009.⁴³ With the advent of Web3 technologies such as [Toucan Protocol's Base Carbon Tonne \(BCT\)](#), the market for tokenized carbon offsets is scaling in parallel. BCT's market success drew the attention of well known carbon certification bodies – such as [Verra](#), which recently expanded its blockchain diligence.⁴⁴

Growth of the voluntary carbon market over the years



Adapted From Blaufelder, Christopher (2020). [How the Voluntary Carbon Market Can Help Address Climate Change](#), in: McKinsey Sustainability

However, carbon offsets and therefore their financing tend to only be granted to mature ecological assets – on proof of carbon storage. Financing possibilities exist, such as futures markets or grants, but are limited, and often fail to deliver the majority of value to territorial managers.⁴⁵ To bridge this financing gap, Kolektivo proposes the staking of ecological tokens. Staking is the act of immobilizing cryptocurrencies in a smart contract in order to support the operations of a protocol or a blockchain. Staking is similar to mining in that it rewards participating users.

43 Blaufelder, Christopher (2020). [How the Voluntary Carbon Market Can Help Address Climate Change](#)

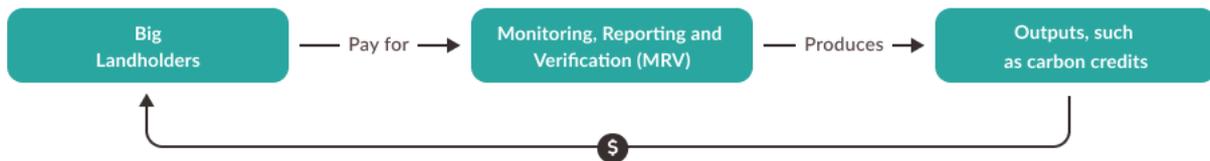
44 Verra (2021). [Verra Releases Legal Due Diligence Questionnaire for Related Instruments](#)

45 Seeberg-Elverfeldt, Christina (2010). [Carbon Finance Possibilities for Agriculture, Forestry and Other Land Use Projects in a Smallholder Context](#)

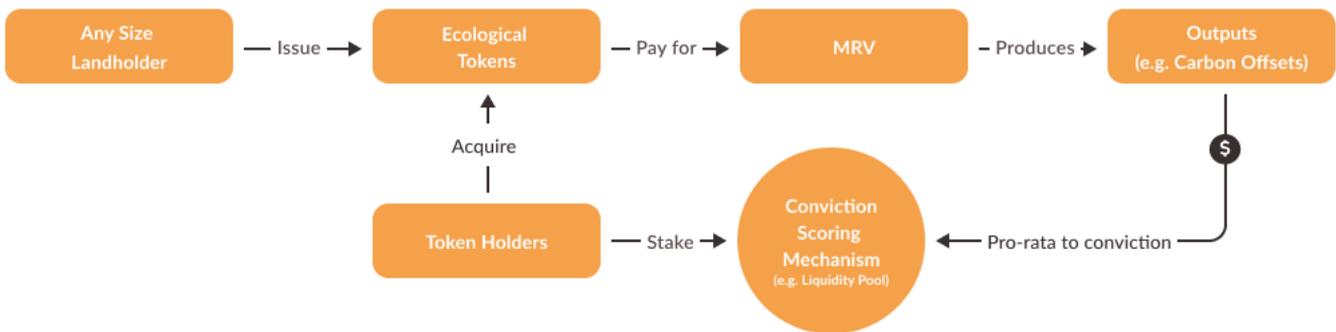


In Kolektivo’s proposed territorial staking, when a territory reaches carbon maturity, stakers would receive either the revenues of generated outputs or the outputs themselves as rewards proportional to the [quantity of ecological tokens staked x length of time staking] – a form of territorial conviction.⁴⁶ Practically, this means that the revenues from the sale of tokenized offsets or the offsets themselves would be correspondingly distributed to stakers. If the outputs are valuable enough, the open nature of blockchain enables anyone – from large-scale farmers to managers of small forest-gardens – to create a GeoNFT, fractionalize it, and attract speculative outputs funding by issuing ecological tokens.

High fixed MRV costs reduce outputs market participation



Ecological tokens bridge the output-financing gap



Parametric Insurance

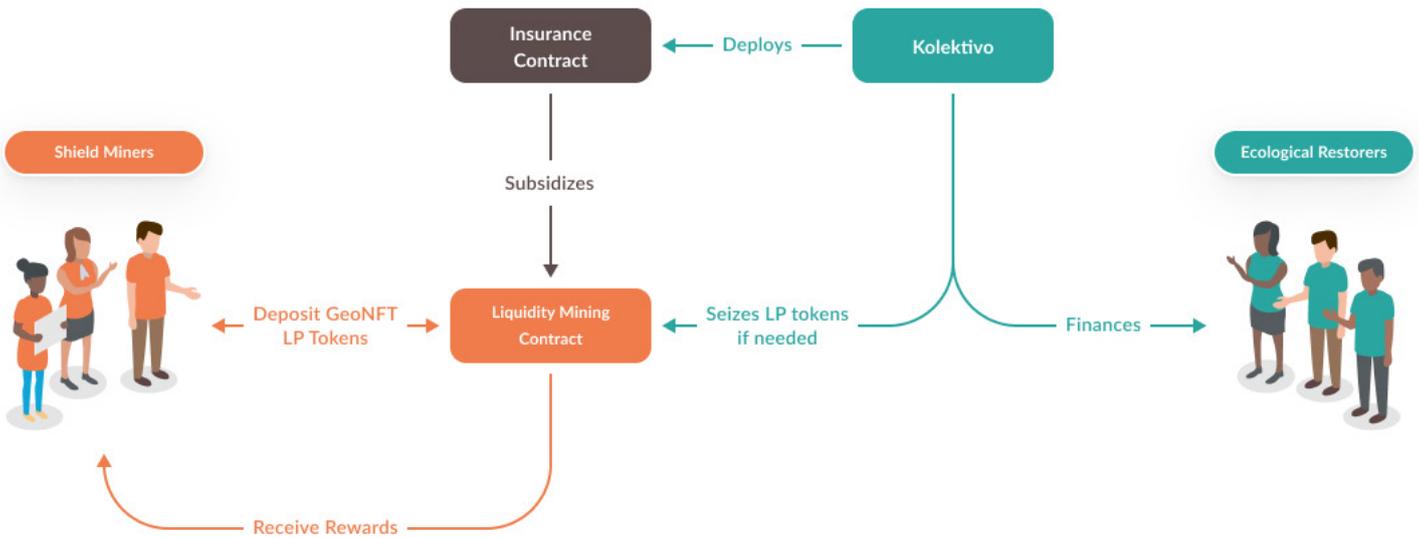
Accumulated ecological data over time provides us with long-term ecosystem information that allows scientists and risk assessors to determine an acceptable and productive ecological state. For example, the development of indices delimiting the physical qualities necessary for the development of certain species – such as the soil fertility index⁴⁷ or the Posidonia Ecosystem-Based Quality Index⁴⁸ – are effective means of recognizing, anticipating, and mitigating environmental problems.

Today, the environmental insurance market does not face liquidity, but access issues: access to both the data necessary to design effective coverage, and to market actors demanding insurance. Kolektivo’s parametric insurance addresses each in turn by bridging the gap between data production and insurance formulation at the local level, and conjoining market supply and demand by leveraging DeFi at the global level. It is a [cryptonative mutual insurance](#), where risk is underwritten by so-called shield miners of a shared staking pool. Governance of the pool and its corresponding claim processes are subject to each community economy, with capital accessible through global crypto markets.

46 Gardens – a DAO framework – provides a [link](#) around the usefulness of conviction scoring: “Rather than relying entirely on majority rule decision making, resource allocation decisions are regulated by staking on proposals to accumulate conviction over time. This allows resources to be allocated fairly, while minimizing the political and divisive process of coming to consensus on a single course of action.” For more on conviction scoring, see “[Conviction Voting: A Novel Continuous Decision Making Alternative to Governance](#)” Emmett (2021).

47 Patil, Parameshgouda L., et al. (2019). [Identification of Soil Fertility Constraints by GIS in Dudihal Sub-Watershed Under Northern Dry Zone of Karnataka For Site Specific Recommendations](#)

48 Personnic, Sebastien, et al. (2014). [An Ecosystem-Based Approach to Assess the Status of a Mediterranean Ecosystem, the Posidonia oceanica Seagrass Meadow](#)

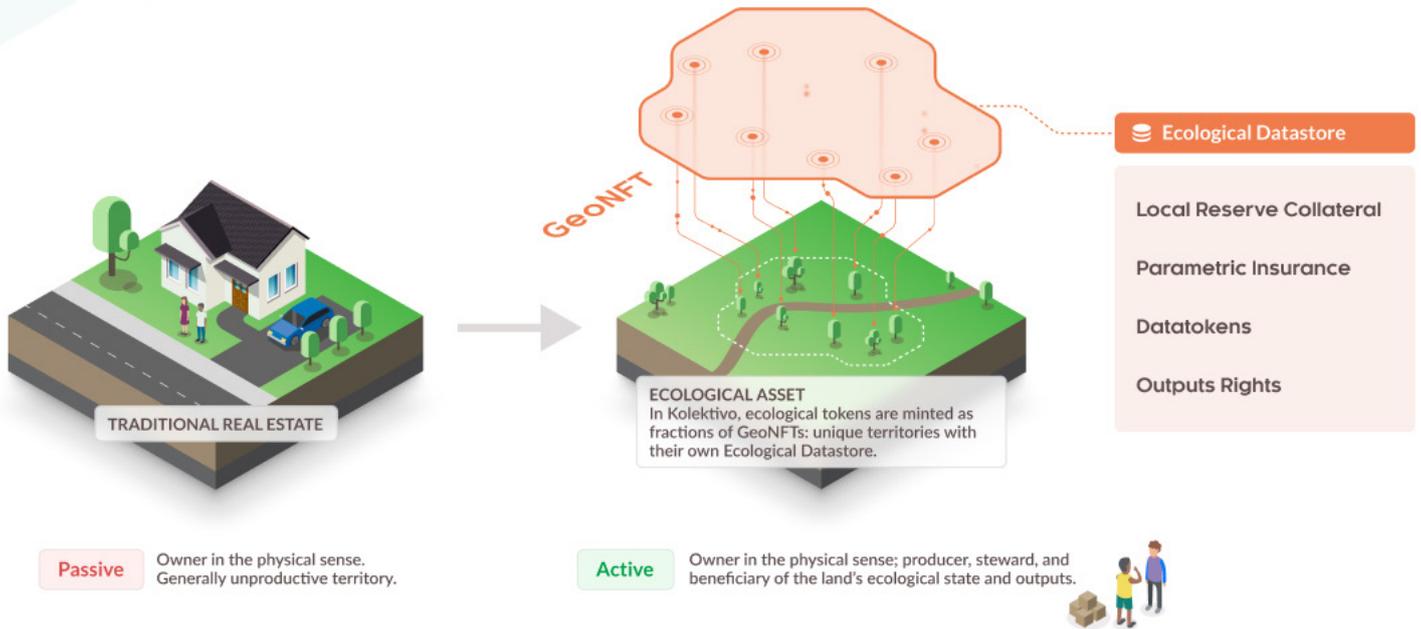


1. **A Kolektivo Reserve deploys a type of [Liquidity Mining Contract](#) for some GeoNFT.** Liquidity Mining, also known as yield farming, helps generate market depth for tokens traded on the open market. It is at this stage that the mining contract will accept LP tokens of mixed stable and ecological tokens to stabilize the insurance payout mechanism. In this first step, a scientifically established threshold demarcating “good state” from “bad state” must be defined, establishing payout conditions for the insurance policy.
2. **Next, parties interested in earning yield deposit tokens to the Mining Contract, thus becoming what we term Shield Miners.** In other words, the shield miners agree – in exchange for a regular subsidy (the yield) – to cover the risk of some GeoNFT’s ecological state deteriorating. These shield miners are not ultimately receiving a risk-free reward: they are providing a Peer-to-Peer (P2P) service as underwriters. It is important to set a cap on the cost of cover, as insurance should not cover unlimited risk, nor should yield issuance be set too high when above such a ceiling, overpaying for insurance.
3. **Third, monitoring is put in place in order to track the ecosystem’s health.** Monitoring could consist of IoT, participatory (human), or remotely sensed data inputs. Some inputs may be native to the GeoNFT, measured and verified by its community economy; others may be external, such as the [Shamba ReFi oracle service](#). Parametric ecological insurance is diverse, custom, and context-dependent: its reporting sources must match such requirements.
4. **Finally, if the threshold is breached, the staked LP Tokens are redeemed.** These funds are distributed to pre-designated ecological restorers who are qualified to bring the GeoNFT’s territory back to optimum ecological state.⁴⁹

⁴⁹ Note that unstaking is limited during high risk periods depending on the context of the insurance, e.g., for summer months drought insurance will have a much longer unstaking period than rainy seasons, where the risk is less present.



Ownership



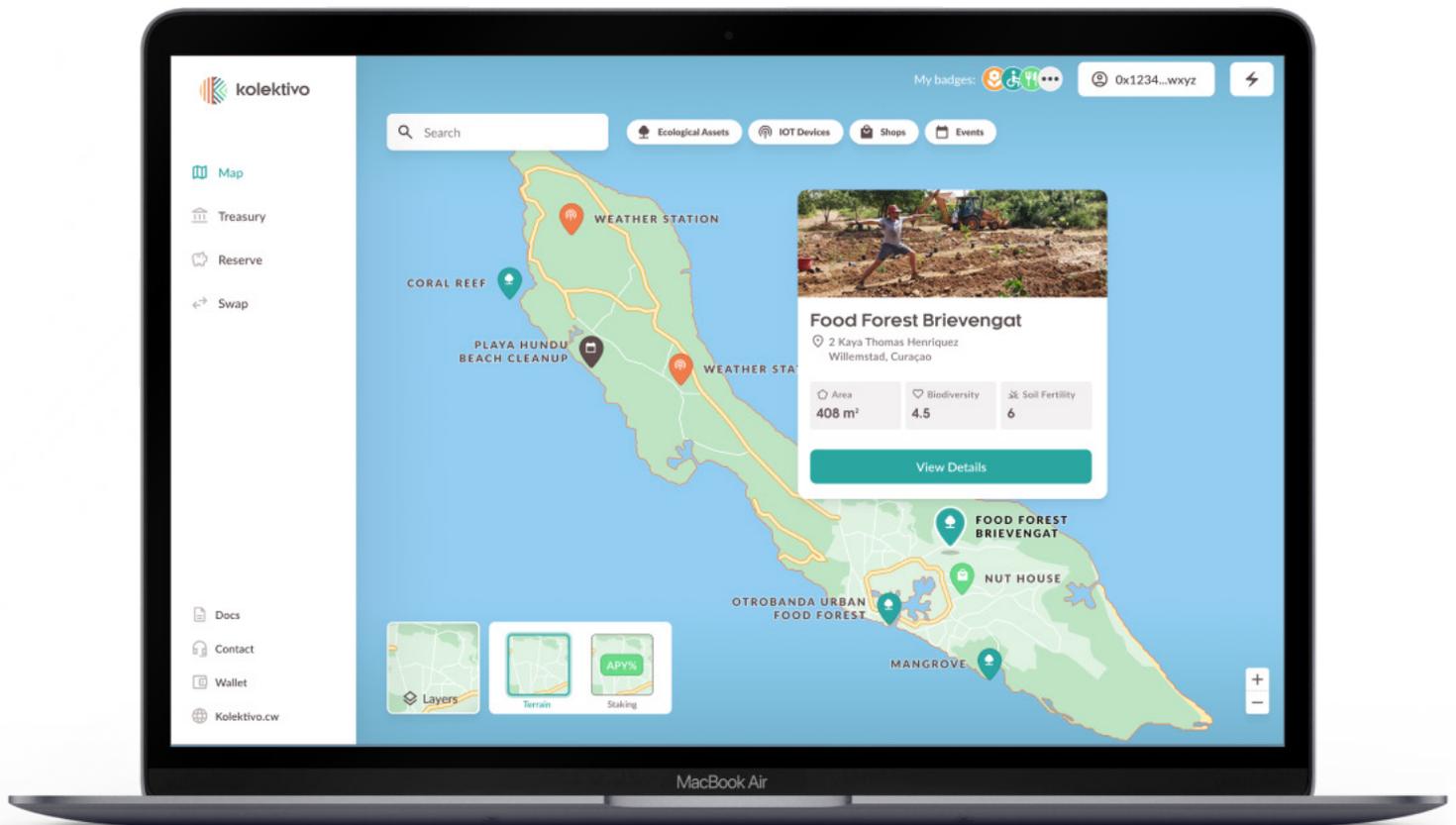
The engineering behind new forms of ecological assets prompts the question of: *why not simply tokenize land titles as ecological capital?*

- **Foremost, many of the types of territories and ecosystems stewarded by Kolektivo should or cannot be privately held.** These include public territories, such as reef structures, or long-term public leases, such as a 100 year lease for a food forest. Fractionalization of the legal private ownership of these territories makes little sense as they are not privately held in the first place.
- **The tokenization of private ownership tends to harm the ideal ecological state.** Land grabs are historically exploitative, designed to grant access to rich territories at the expense of their ecosystemic health. At the very least, remote ownership undermines the ability for local actors to build their own capital stocks and wealth, as land is a key asset class that is by definition scarce.
- **Private ownership sits in ideological tension with Kolektivo's vision.** The Kolektivo Framework is being developed to offer an alter-economic space for actors and communities who are underserved in the present day. Its communitarian paradigm cannot be achieved if territorial wealth is privately concentrated.

Although the GeoNFT and its fractionalization smart contracts are compatible with NFT land titles, real estate should still be monetized through parametric insurance, ecological datatokens, and outputs rights. When this is done, landowners transform from being mere owners in the legal sense to producers and stewards of the land's ecological state. In this paradigm, the network's thriving supersedes individual greed.



The Impact Map



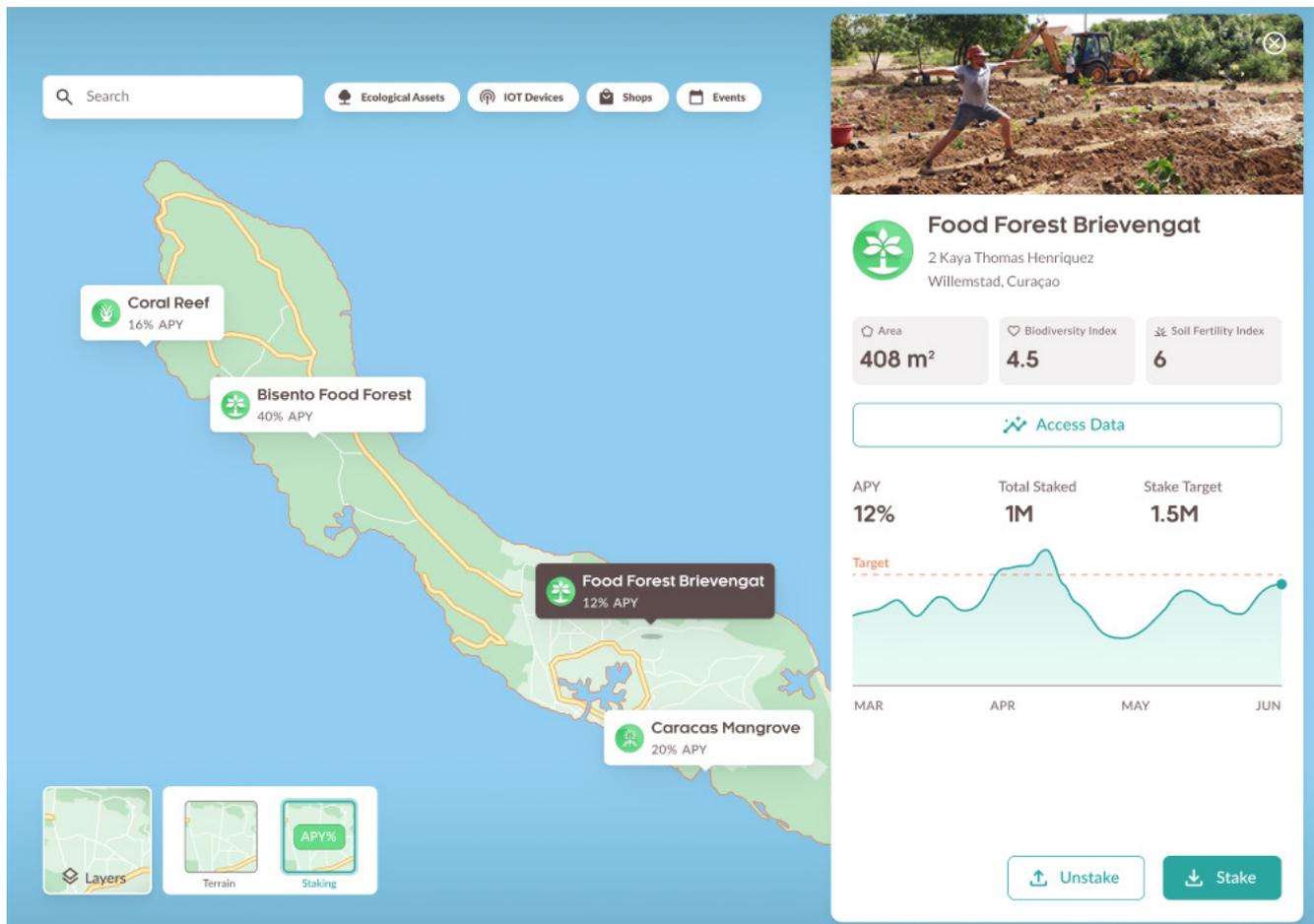
Kolektivo's Impact Map provides key coordination and ecological monetization support for the community economy. It not only displays the community's GeoNFTs, but also key metadata — such as environmental index ratings. It offers novel functionality such as staking in GeoNFT insurance pools. It is vital to provide a top-down perspective on where and which GeoNFTs currently exist, and what groups are managing such territories, revealing impact opportunities across the entire community economy. There are three types of GeoNFTs that will initially display on the impact map:

- **Merchants**, who provide goods and services to the community economy. Merchant GeoNFTs tend to be point-based geo-coordinates. As tooling for merchants improves, a host of speculative post-MVP features become feasible, such as DAO-to-DAO tooling in support of P2P merchant credit issuance and liquidity formation,⁵⁰ or data storage of inventory and active enumeration of stocks. Visualizing provenance, trade, and liquidity relations between merchants is essential to greening supply chains and identifying key nodes of the community economy.
- **Tokenized ecological assets**, such as Curaçaoan food forests. These GeoNFTs are generally area based, as their area helps determine the quantity of ecological tokens produced by their fractionalization.
- **Individual data-producing devices**, such as weather station nodes with their own data streams. Note that while these individual nodes are producing data that can be monetized through tokenization, value is enhanced by aggregating nodes and unionizing into a DAO producing climate data, such as the [dClimate DAO](#).

⁵⁰ Imagine a geographic union of merchants collectivizing themselves in some region as a DAO, who initiate a liquidity bootstrapping mechanism to their combined benefit.

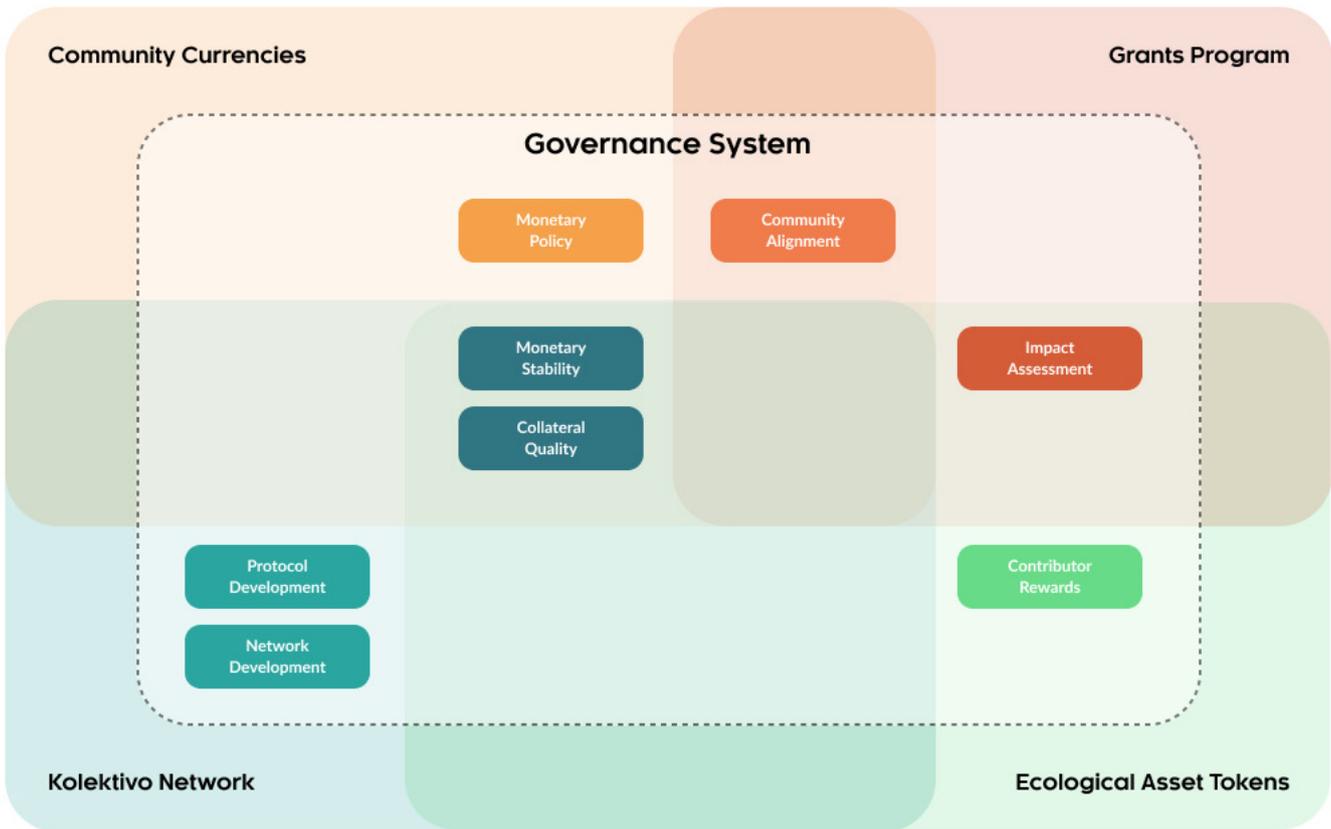


Other non-Web3 objects to be displayed on the impact map include community challenges and events. Challenges consist of broadly crowdsourced bounties, such as beach clean-ups; events may include festivals or other celebrations co-produced by the community economy.





Governance



Governance structures define how fundamental transactional relationships within the community economy are governed. For Kolektivo, its governance technologies can be thought of as those technical layers that structure decision making processes. The MVP follows a [guarded launch pattern](#), with relatively concentrated decision making early on and built-in capability to distribute governance authority more broadly over time.

- The Kolektivo Network’s top-level governance is represented by the **Kolektivo Network Stewards**. These Stewards manage internal and external financials for the Network and assign critical roles and corresponding rights for these roles in the network’s global context.
- **Local Kolektivo Stewards** collaboratively manage community-specific monetary functions that are not automated, including transferring assets, metagovernance of assets, or parameter adjustments to the Reserve, or in the case of Kolektivo Curaçao, quality assurance regarding the reported ecological asset state.

Both on the network and local level, stewards can appoint and supervise delegates to carry out specific responsibilities within the system.⁵¹

⁵¹ It would be impractical for a top-level council of stewards to jointly carry out all of the required tasks for the Kolektivo Network or a community economy; first, coordination among stewards would be time/resource intensive, and second, many tasks require specialized knowledge. While DAOs today tend to opt for a handful of delegates to represent thousands of token holders, this only works in a virtual environment where the diversity and quantity of actions taken by these delegates is limited to on-chain transactions.



For the Kolektivo Network, the first Network Stewards will consist of the board members and their associates of the Regenerative Finance Foundation – a Curaçao Non-profit Foundation supporting the Kolektivo Framework. These Network Stewards will initially govern the Kolektivo Network Treasury and take the initial responsibility of (a) collaborating with builder groups (b) providing operations support for development of the Kolektivo Framework and (c) transferring KTT to seed and support new community economies.



For Kolektivo Curaçao, local stewards will be initially made up of the board members or their associates of the Innovation Ç Foundation – a Curaçao Nonprofit Foundation supporting Kolektivo Curaçao. These Local Stewards have a much more active role to play compared to their Network counterparts, and must assign a plurality of roles across their community economy.

Governance Modules

In addition to common soft or social governance processes, such as community norms, the Kolektivo MVP provides a robust technical layer for on-chain governance of its technologies. Five primary modules interact in support of governance of the Kolektivo Framework:

Celo Safe	A multisignature wallet (forked from Gnosis Safe) used to manage shared resources and enable collective action.
Gnosis Zodiac's⁵² ScopeGuard	Scopeguard makes it possible to restrict the types of transactions that a Safe or another module can make. Control over the ScopeGuard can be assigned to another entity, which in turn can decide which actions the scoped Safe or module can take.
BAC	Badger Access Control (BAC) is a fork of Gnosis Zodiac's Roles Modifier . It enables a Safe to delegate the permission to call certain functions on behalf of the Safe to another externally owned address or smart contract. A so-called delegate can call specified functions without requiring the M of N consent of the associated Safe. As opposed to Zodiac's original implementation which kept the record of delegates internally, BAC refers to an external ERC1155 token contract – the Badger – to determine if an address is a qualified delegate, namely by checking if that address holds the required badge – a type of NFT.
BADGER	The Badger contract is an ERC1155 token contract through which non-transferable and transferable badges are assigned. These badges can be used for many purposes, such as assigning delegates via the BAC module, attributing governance rights (e.g., voting via Snapshot), decrypting private information (e.g., using Lit Protocol), or authorizing other off-chain functionalities, such as permissioning ecology data delegates write access to various GeoNFT datastores. User research discovered that many users feel an emotional association towards their accumulated badges, i.e., a sense of pride; to this end, badge assignment is similar to receiving an accolade.
SecretDelay	A fork of Zodiac's Delay Modifier. The original Delay modifier introduces a three step process for making Safe transactions: (1) authorized addresses can propose a transaction, then after a (2) pre-configured cooldown period passes, (3) the transaction becomes executable by anyone. During the cooldown period, the associated Safe can step in and dismiss a proposed transaction. SecretDelay extends these capabilities by adding two features: <ul style="list-style-type: none"> • It allows to propose secret transactions by just submitting a hash of the transaction in the first step • It introduces an acceleration mechanism where the associated Safe signers may approve transactions for immediate execution. <p>The addition of these two features better serve a real-world user community, where certain transactions may need to be private or expedited in the event of an emergency without any major disruption to the functioning of a community economy.</p>

52 Zodiac modules, modifiers, and guards are a family of extensible open-source modules customized for the Gnosis Safe. See: [Zodiac Documentation](#).



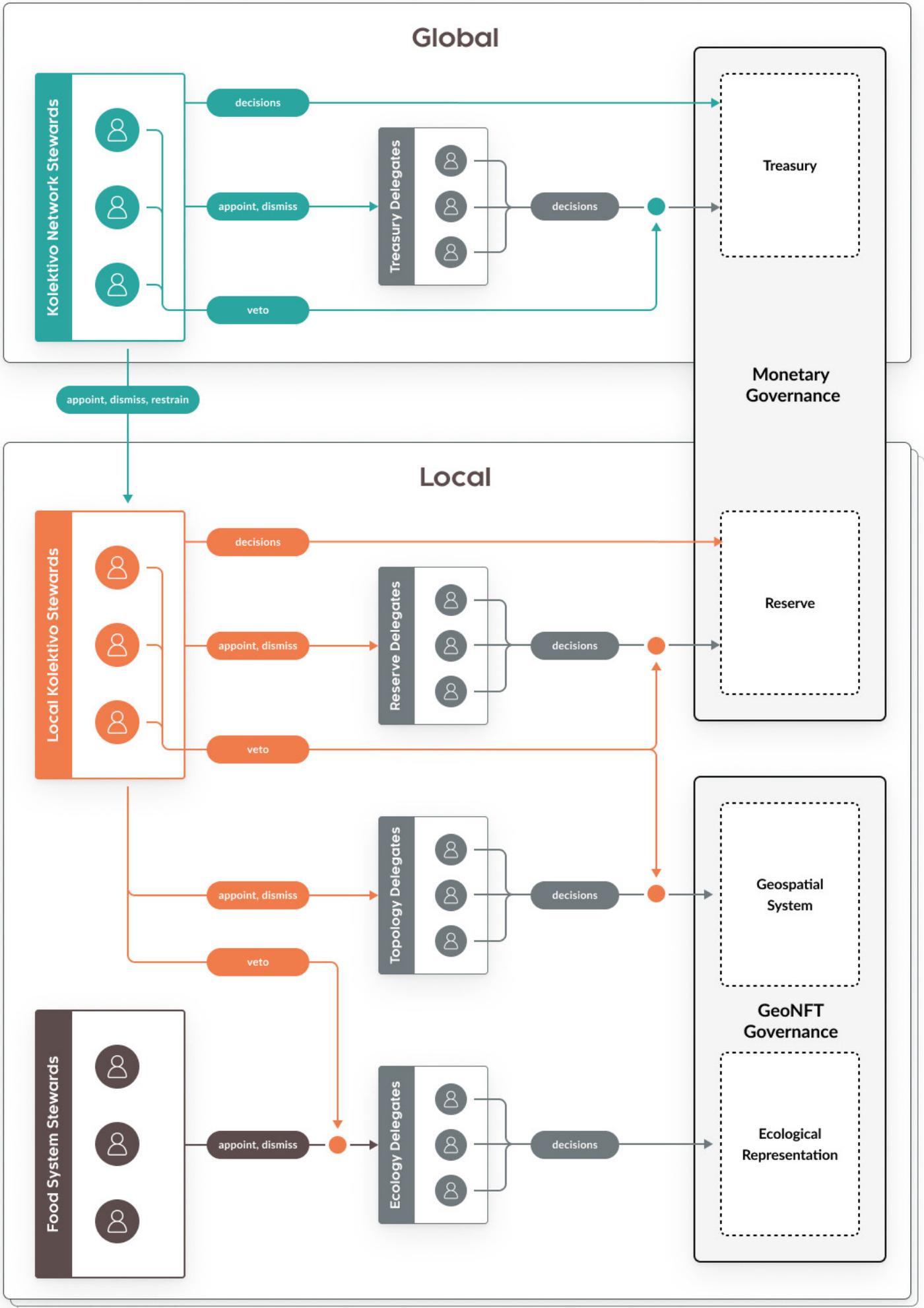
Kolektivo Curaçao Governance Roles

Governance of Kolektivo Curaçao flows top-down, where Stewards assign roles depending on function; similarly, certain roles can assign permissions to roles beneath them, fleshing out a permissions hierarchy. Many roles are associated with functions that correspond to the afore listed modules:

Treasury Delegate	Can propose secret transactions to be executed by the Kolektivo Network Stewards' multisig for the Treasury.
Reserve Delegate	Can propose secret transactions to be executed by the Local Kolektivo Stewards' multisig for the Reserve.
Veto Delegate	Can veto transactions that have been proposed, preventing their execution.
Topology Data Delegate	Can interact with GeoNFT and spatial registry contracts. Practically, this means adjusting the geographic boundaries of a GeoNFT, or determining which GeoNFTs sit under Kolektivo Curaçao's governance.
Ecology Data Delegate	Can write to restricted off-chain data storages, such as a GeoNFT ecological datastore.
Monetary Controller	Can change ownership structure of the Monetary multisig and enable new modules.
Ecology Delegate Manager	Can propose the minting of Ecology Data Delegate badges.
Asset Manager	Can manage idle assets on behalf of the associated multisig.
Arbitrageur	Can make use of arbitrage opportunities that help to re-balance the monetary system.

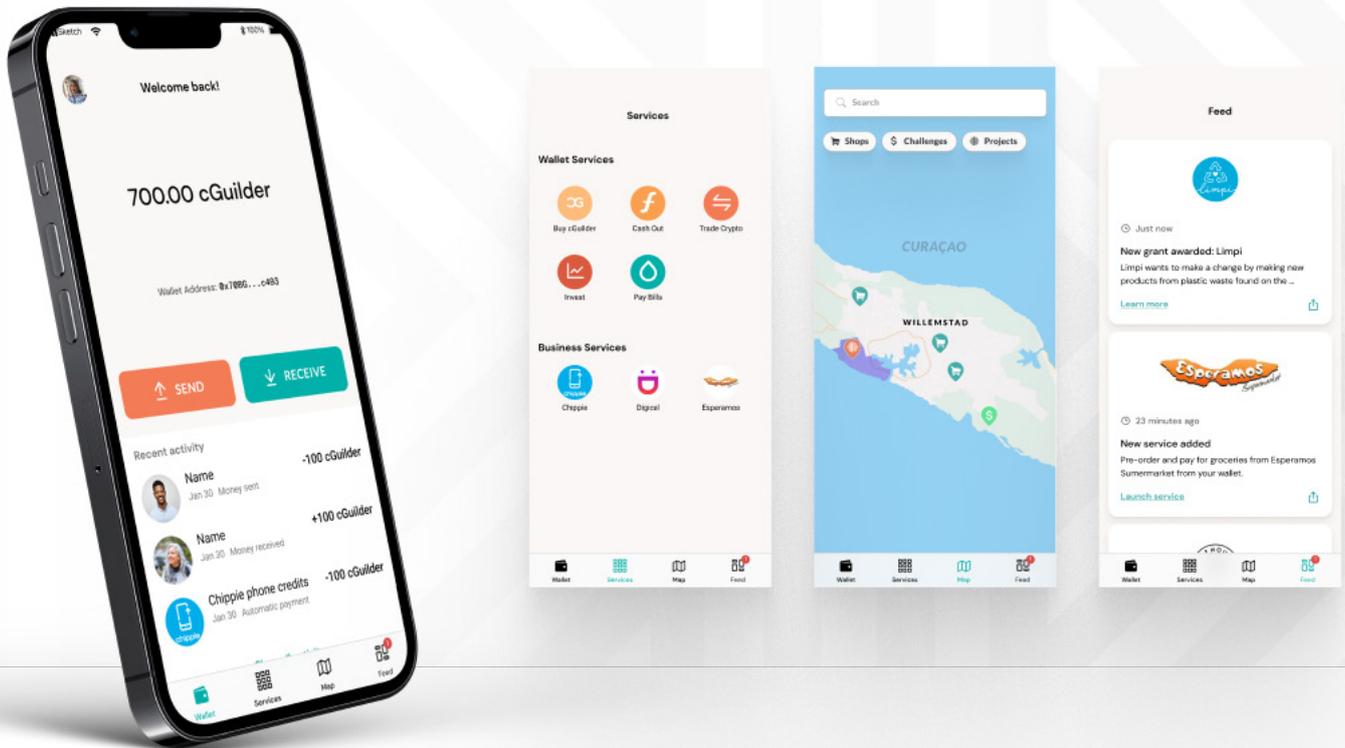


Governance Architecture Overview





Kolektivo Wallet



Cryptocurrency wallets are used to track ownership of, receive, and spend cryptocurrencies, as well as engage with smart contracts. As such, the wallet is the pivotal interface for users of Kolektivo's community economies, and must be optimized to the unique circumstances of real-world needs.⁵³ One example of this is the Kolektivo Wallet's introduction of a social recovery feature, which eliminates the harmful antipattern of maintaining a mnemonic phrase that many real-world users lose or misplace.⁵⁴

The Kolektivo Wallet is a parallel fork of the Celo ecosystem's popular [Valora](#) wallet, a mobile-first wallet that provides an apt starting place for optimizing a wallet for local and non crypto-savvy communities:

- Crypto-assets can be **transferred with little more than a phone number**. A user can transfer funds to anyone, even if they don't yet have a wallet.
- The integration of the [Bidali](#) marketplace provides practical access to many goods, such as phone data credits or popular gift cards.
- Celo's **low gas fees** make payments simple and hassle-free.
- An **in-wallet fiat ramp** streamlines funding of the wallet.
- As an added bonus, **Celo is a [carbon negative blockchain](#)**, consistent with the values of the Kolektivo Network.

53 For a deep dive into UX research conducted in this direction, please see [It Takes a Consortium: Participatory Design in Regenerative Finance](#), Curve Labs (2022).

54 "A social recovery system works as follows: There is a single "signing key" that can be used to approve transactions. There is a set of at least 3 (or a much higher number) of "guardians", of which a majority can cooperate to change the signing key of the account." [Why we need wide adoption of social recovery wallets](#), Buterin (2021)



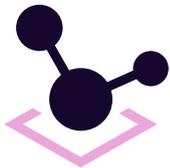
Supporting Technologies

The Kolektivo Framework takes a practical and high-level composable perspective on the integrative use of Web3 technologies. Kolektivo opts to use those modules available for production and collaborate with leading solutions providers, seeing itself as a member of a broader open-source ecosystem.



Symmetric

[Symmetric](#) is an AMM and decentralized exchange platform built on the Celo blockchain as a fork of [Balancer](#). Symmetric will be used by Kolektivo to create and host liquidity pools, enabling fast and easy decentralized exchange for the Kolektivo Network. The Reserve's proxy price ceiling/floor mechanism wraps around Symmetric pools to help regulate the price of the Reserve Token (see [Monetary](#) section).



Prime Deals

[Prime Deals](#) is a platform to host and facilitate various types of DAO to DAO negotiations – such as token swaps. Prime Deals will be used as a supporting technology for interactions and negotiation between the Kolektivo Network Treasury, Reserves, and environmental stewardship organizations; i.e., Ecological subDAOs.



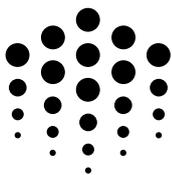
The Proposal Inverter

Originated by [BlockScience](#), [Longtail Financial](#) and [PrimeDAO](#), this tool facilitates collaboration by multiple groups or individuals on common initiatives. The Proposal Inverter inverts the DAO-proposal relationship such that instead of having many proposals for a single DAO, many DAOs can collaborate and be compensated for a single proposal.



Lit Protocol

Lit Protocol provides decentralized identity-based encryption and access control services. It is used within Kolektivo's governance system to establish private information channels between holders of different governance-related badges.



Ocean Protocol

Ocean Protocol uses encryption and cryptoeconomic design patterns to provide a decentralized platform for data markets. It, or an adaptation of it, will be used by Kolektivo for ecological state datatoken markets.



The Kolektivo Curaçao Community Economy

450+ Early Participants

40+ Community Grants Since 2020

15+ Kolektivo Curaçao Team Members

5+ Years Building Ecosystem in Curaçao



The MVP takes place in Curaçao, a 444 km² island nation located in the southern Caribbean. It houses close to 160,000 humans and thousands of other species – many of which are rare and endemic.⁵⁵ The island is especially biodiverse, rimmed by fossilized coral reefs and fringed by mangroves. It houses hundreds of breeding and migratory bird species and several sea turtle nesting grounds.⁵⁶

Just like many others across the globe, Curaçao's ecosystems are facing serious challenges. Sea level temperature increases have already caused widespread coral bleaching,⁵⁷ rendering the island's inhabitants more and more vulnerable to hurricanes.⁵⁸ Overfishing has caused a 90% decline in catches between 1904 and 2006.⁵⁹ 75 Dutch Caribbean species are now endangered or vulnerable⁶⁰ Sea level rise threatens mangroves and erodes beaches.⁶¹ Despite international inaction, local scientists and volunteers are working towards protecting and restoring the wealth of Curaçaoan flora and fauna, such as [Reef Renewal Curaçao](#), [Sea Turtle Conservation Curaçao](#), and [Curaçao Nature Conservation](#).

Kolektivo Curaçao is the latest and largest initiative in a series of efforts to advance blockchain-based decentralized self-organization in Curaçao. It continues on from the [CuraDAO](#), which launched early 2019. In early 2021, CuraDAO was renamed Kolektivo Curaçao, accommodating the wider ambitions of the project.

55 Dutch Caribbean Nature Alliance. [Dutch Caribbean Species of High Conservation Value](#)

56 Wikipedia. [List of birds of Curaçao](#)

57 Marinus de Bakker, Desiderius (2019). [40 Years of Change on the Coral Reefs of Curaçao and Bonaire](#)

58 DCNA (2016). [Climate Change Impacts Within the Dutch Caribbean](#)

59 Waitt Institut (2017). [The State of Curaçao's Coral Reefs](#)

60 Aruba Today. [Dutch Caribbean Nature Alliance \(DCNA\): Endangered Species](#). According to the [WWF](#), an endangered species is considered to face a very high risk of extinction in the wild, while a vulnerable species faces a high one.

61 UNESCO (2021). [Mangroves Ecosystems in Caribbean SIDS: Curaçao](#)



CuraDAO strove to improve collaboration in Curaçao by providing community tools and incentives in an inclusive environment. It distributed impact grants via transparent community decision-making. CuraDAO's governance and grant issuance took place on the DAOstack platform – an early Web3 budgeting and resource-allocation tool for DAOs. Anyone could submit proposals to fund social and environmental impact projects in Curaçao and receive funding.

CuraDAO gathered a community of more than fifty members – from Web3-natives to Curaçaoan impact business leaders and representatives of local NGOs. In its two years, the community voted on almost fifty proposals driving social and environmental impact, ranging from beach clean-ups to local commerce. CuraDAO was presented at the yearly Innovation Ç technology and impact conference in Curaçao, whose guests have included important officials such as the Prime Minister of Curaçao.

Community Currencies: From CuraDAI to kGuilder



One key CuraDAO project was the launch and subsequent governance of the community currency CuraDAI in early 2020 – first on the Ethereum and then the Fuse blockchains. CuraDAI was a stablecoin fully collateralized by DAI and pegged to ANG. CuraDAI tested the feasibility of introducing an additional means of local exchange, issuing grants in a cryptocurrency, and improving cross-border transactions. These efforts proved fruitful: in 2020 the CuraDAO financed its first food forest, trading CuraDAI for yield. Today, CuraDAI is still used for payments on the island, and with the MVP, will transition to kGuilder.

Building Regenerative Finance on Celo

Climate Collective

In late 2021 Kolektivo Curaçao – along with the other members of the Kolektivo Network – joined the [Climate Collective](#): an expanding coalition of projects, DAOs, and companies working towards Web3 climate solutions. As a founding member of the Climate Collective, Kolektivo received a grant from the Celo Foundation to support the incubation of a regenerative finance R&D program on Celo. This grant has since advanced the Kolektivo Framework to an [EU Technology Readiness Level 7](#): “System prototype demonstration in operational environment” – or in our case, Curaçao.



Key Initiatives

Tokenizing Curaçaoan Ecological Assets

One key hypothesis of the Kollectivo Curaçao community economy is that ecological tokens can be used to back the community's currency – kGuilder. The first ecological assets to be tokenized will be sustainable agroforests, or food forests. Following this, the community economy's attention will extend to include the island's reefs and mangroves: two keystone habitats that provide critical ecosystem services to their surroundings.

Sustainable Food Forests



A food forest is an area that mimics natural forest patterns, but it is made up of species useful to mankind – mainly edible plants, but also related products, such as medicinal plants, building materials, fibers, firewood, or animal fodder. These sustainable agricultural systems are rich in amenities, and require comparatively few agricultural labor inputs for upkeep upon maturity. They are one of the oldest forms of land use and resilient of agroecosystems. They originated in prehistoric times, along the jungle-covered riverbanks and in the moist foothills of monsoon regions.



“The Seven Layers of a Tropical Food-Forest”



- 1 Canopy (large fruit and nut trees)
- 2 Low Tree Layer (dwarf fruit trees)
- 3 Shrub Layer (currants and berries)
- 4 Herbaceous (comfrees, beets and herbs)
- 5 Rhizosphere (roots vegetables)
- 6 Soil Surface (ground cover, eg, strawberry, etc)
- 7 Vertical Layer (climbers and vines)

As these community-managed agroforests can feed dozens of families even on modest-sized plots of land, they play a dual ecological and social role. Most Kolektivo food forests are cultivated according to principles of syntropic farming, aiming to regenerate soils in a short amount of time by leveraging the power of natural succession.

By tokenizing these food forests, liquidity is provided to food system initiatives that produce valuable ecological state data. Additionally, Kolektivo Curaçao’s governance system reinforces consistency among agricultural actors, favoring sustainable agricultural practices and management. Sustainable agricultural standards – a type of Kolektivo Curaçao certification – are applied in order to tokenize the food forest. Failure to meet these standards means a food forest in question cannot be fractionalized as Kolektivo food forest tokens.

In the future, the monitoring of ecological state will fuel a parametric insurance mechanism, helping protect these food-producing oases against climatic hazards.



Coral Reefs and Mangroves



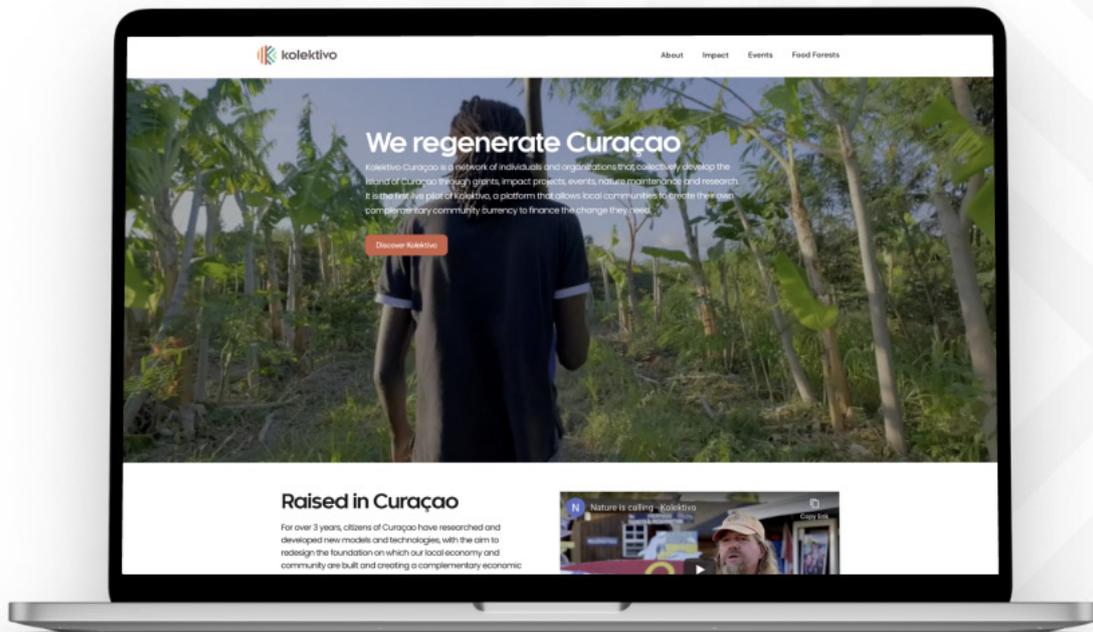
Following the same logic as food forests, ecological state data produced from coral reefs and mangroves will be tokenized as ecological tokens. The governance layer on top of this tokenization will initiate and improve the coordination of restoration and protection efforts. Thanks to the data collected from participatory environmental monitoring methods, the deployment of a parametric insurance mechanism becomes feasible as a means of protecting and restoring coral reefs and mangroves.⁶²

- **Coral reefs** are crucial limestone skeleton formations that provide dozens of ecosystem services – from supporting the world’s densest concentration of marine biology to coastal erosion protection. Curaçao is surrounded by narrow fringing coral reefs, considered some of the most diverse and healthiest in the Caribbean. For a long time, these reefs supported the island’s fishing industry, and in recent decades, they have been a cornerstone of the tourism industry. However, [almost half of the coral reef cover has vanished](#) due to human pressures. To prevent these precious formations from decaying, restoration activities are required, some of which are today already supported by grants issued by Kolektivo Curaçao.
- **Mangroves** are a type of maritime marsh ecosystem consisting mainly of woody plants. They only develop in the tidal swing zone of tropical regions’ low coasts. Mangroves provide food security, coastal protection, carbon storage, and natural disaster risk mitigation benefits. They are nesting sites for birds and a wide range of marine species. The pressure on mangroves is alarming, as coastal mangrove areas are of great value to the tourism sector – a pillar of the economy for many tropical regions.

⁶² Note that coral reef and mangrove restoration has been demonstrated in a recent study as a cost-effective solution in more than twenty Caribbean countries, as these two restored ecological assets can provide up to six figures USD in flood protection benefits over project lifetimes. Beck, Michael W., et al. (2022). [Return on Investment for Mangrove and Reef Flood Protection](#)



Kolektivo.cw: An Impact Portal



To delimit Kolektivo Curaçao’s local mandate from the Kolektivo Network’s more global scope, its members have built their own impact portal. Every community economy is not dissimilar from a DAO or cooperative, and to this end, need their own means for self-organization. [Kolektivo.cw](https://www.kolektivo.cw) is designed to embed new regenerative practices, inform, and engage the people of Curaçao. From this portal, the community can:

- **Apply for grants**, supporting real-world impact. Grants are voted on by stewards representing Kolektivo Curaçao’s six impact areas.
- **Participate in community challenges** – a type of real-world bounty where the community earns by doing good.
- **Learn about Kolektivo**, and its corresponding projects, network, and framework.
- **Register their own project**, joining the community economy as co-participants.
- **Access a public dashboard for the community economy**, with important information on the state of the Kolektivo Curaçao Reserve.
- **Read and publish blog content**, produced by and for the community.
- **Stay up-to-date on the latest events and community updates.**



Creativity, Culture and Arts



Entrepreneurship, Technology and Innovation



Healthy Ecosystems and the Environment



Equitable Communities and Governance



Leadership and Human Development



General Kolektivo



Regulatory Efforts



In partnership with [IBIS Management Associates](#), a financial consulting and technological development company specializing in the Caribbean and Latin America, a regulatory sandbox proposal has been submitted to the Centrale Bank Curacao & Sint Maarten.

A regulatory sandbox is a 'safe space' in which businesses test innovative products, services, business models and delivery mechanisms, without immediately incurring all the normal regulatory consequences of engaging in the activity in question. The proposal supports a regulated fiat ramp in Curaçao to enable financial flows between the Kolektivo Wallet and participating financial institutions. The primary user benefit is direct, KYC/AML permissioned exchange between kGuilder and ANG using the Kolektivo Wallet.

Participatory Methodology

To prevent the Kolektivo Network from common failure modes, we privilege [participatory design](#) as a working method. Participatory design is a methodology that involves the end-user at every stage of product research, design, and development. Ultimately, it emphasizes the active role of users through interviews, observation, prototyping, and user scenario production.

The most direct benefits include user loyalty due to the sharing of information and values, and the establishment of community norms, where the user accepts their role as a co-manager of the final product. Given that Kolektivo aims to produce democratic and flexible institutions governed by its user communities, participatory design is necessary to boost its antifragility vis-à-vis external actors and shocks.



Network Seed Fundraise

Kolektivo Network Token Offering (KNT)

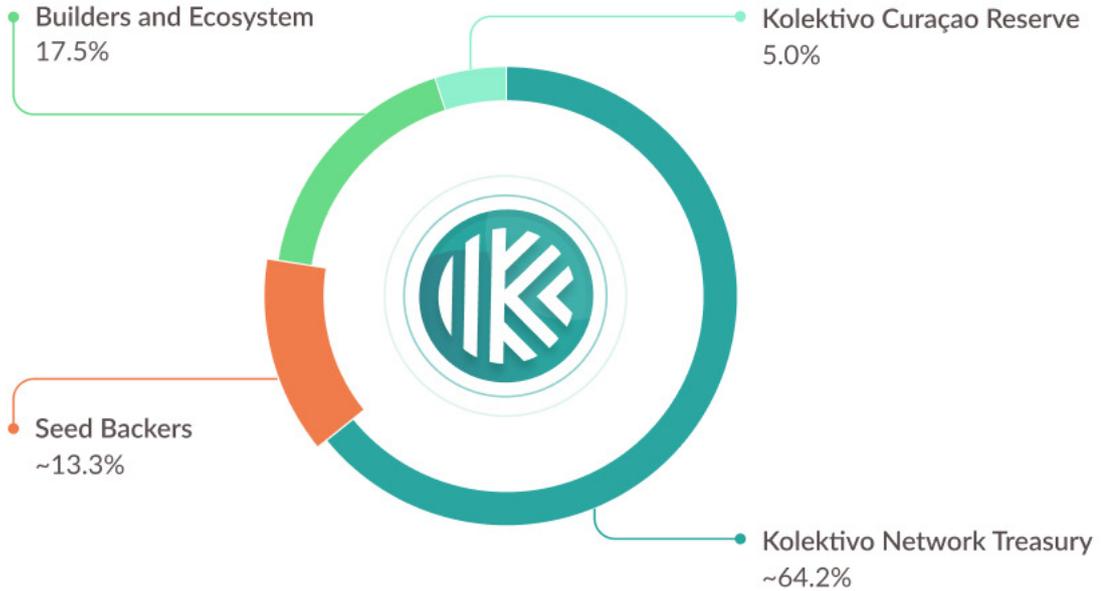
Total Token Supply	100m
Valuation	\$15m
Price Per Token	\$.15
Available Seed Tokens	13.33m
Raise Size	\$2m
Vest	One year cliff, two year vest. Vesting begins upon the issuance of the Kolektivo Network Token sometime in 2023.

The Kolektivo Network is raising \$2m through a seed offering of KNT to establish a leading position in the Regenerative Finance sector. From this seed of seeds, the first real-world community economies will be established to produce critically needed ecological assets for the broader Web3 ecosystem.

KNT provides certain governance rights over the Kolektivo Network, such as selecting new community economies to seed and structuring / funding the priorities of the Framework's roadmap. Selecting community economies is vital to the success of the network, as ultimately, each seed represents a forward-looking payment for those ecological assets to be produced. Over time, the Kolektivo Network Treasury aims to transition its assets from its native governance token to hundreds of ecological assets sourced from all around the world, each originating from its own seed.



KNT Distribution by Stakeholder Group, Post Seed



The Kolektivo Network is supported today by many builder groups and partner entities:

- **Builder groups**, such as Curve Labs, Kolektivo Labs, or Zed Labs, generally consist of research, design, and development professionals who proactively develop the Kolektivo Framework.
- **Partners**, such as IBIS and the Climate Collective provide unique and diverse benefits to the Kolektivo Network, ranging from regulatory assistance to a general forum for ReFi collaboration.

Builders



Partners





Key Persons

There are a number of key figures from the Builder groups whose ongoing contributions to the Network are critical to its success. As the Network launches additional community economies, and its governance decentralizes, it's expected that key persons will shift over time, with no individual group having total say in its development and roadmap:

Key Persons



Luuk Weber

Founder, Kolektivo Labs

Luuk is a systems designer with a passion for regenerative projects. Luuk is committed to creating ecosystems that empower individuals and provide prosperity for all.



Andy Kirchner

Ecosystem, Kolektivo Curaçao

Speaker, serial entrepreneur, and ecosystem lead. He beat the odds to walk again following a paralyzing accident. Today, he stewards the Curaçao team with a triumphant zest for life.



Pat Rawson

Co-Founder, Curve Labs

Pat is a Web3 architect and regenerative finance advocate. As Curve Labs' co-founder, he directs cryptoeconomic research, design, and software development teams.



Marvin Kruse

Founder, byterocket

Byterocket is a Web3 software development and auditing firm. Marvin leads the team from technical architecture to finished product and is an expert in cybersecurity and best coding practices.



Mark Pereira

Co-founder, Zed Labs

Mark built Zed into a globally recognised Web3 mobile agency by collaborating with some of the largest blockchain projects. He now turns his full attention to applying technology to emerging markets.



Holly Grimm

Tech Lead, Astral Protocol

Diné (Navajo) software engineer building tools for transparent and verifiable measurements of real world assets and natural capital. President of Natives in Tech, supporting Indigenous technologists

Advisors



Sep Kamvar

Founder, Celo

Computer scientist and entrepreneur. Natural capital currency activist. Previous, MIT.



Olivier Rikken

Founder, Emerging Horizons

Dutch Caribbean blockchain speaker and specialist.



Tim Gieseke

Founder, Ag Resource Strategies

Author, "Collaborative Environmental Governance Frameworks." Regenerative agriculture & ecosystem market design.

Future Roadmap

2022

Q4

Ecological

GeoNFT fractionalization module smart contract release.

2023

Q1

Ecological

Curaçao food-forest token and GeoNFT fractionalization interface launch.

Q2

Wallet

Social recovery by designated peers in the event of device loss.

Q3

Monetary

Multi-collateral Mento (MCM) – an advanced Mento where monetary stewards parameterize and map many collateral inputs to multiple community currency outputs.

Q4

Network

Launch of an additional community economy.

EoY

Network

Kolektivo Network and KNT launch.

2024

Wallet

Remote wallet recovery by Kolektivo in the event of device loss.

Ecological

Parametric insurance for underwriting GeoNFT ecological state.

Monetary

Concurrent with MCM, three additional monetary or fiscal policy options, such as cashback rewards or mutual credit.

Ecological

Launch of 2+ ecological assets in addition to food-forests, such as Curaçao mangroves and reefs.

Network

Ongoing development with PrimeDAO advancing D2D mechanisms useful to the Network, such as ecological token co-liquidity formation.

Governance

BAC v2 with qualitative data-driven, geospatial, and network selector mechanisms to which badges can be assigned and economic policies applied.

Governance

Progressive decentralization of the Kolektivo Network through the evolving integration of Web3 governance primitives and Network fractalization.

Network

Ongoing integration of other ReFi protocols in support of regenerative community economies.

Legal and Regulatory

Integration of a real-world asset NFT framework.

Ecological

Decentralized storage of GeoNFT topological and ecological state data.

Ecological

Development of impact map features that support bottom-up Impact DAO liquidity formation and territorial stewardship, i.e. being able to draw a territory, claim stewardship over it, and join a corresponding ecological shard pool to monetize or insure said territory.

Monetary

Progressive integration of an economic dashboard of useful metrics such as total factor productivity or well-being measurements.

Note: The Kolektivo Framework's future roadmap and priorities are subject to change, based on the future governance of the live Kolektivo Network, evolving industry technologies, and community economy user feedback.



Calls to Action

The Kolektivo Network is a fast growing coalition of innovators, impact funders, and environmental stewards who are fostering an ecosystem of community economies. We invite you to join us in support of people and planet.

Kolektivo Network Token Holders

KNT will launch in 2023, with fundraising already underway. Those parties interested in participating in KNT's seed offering should register their interest.

Community Economies

If you and your community want to experiment with the Kolektivo Framework, please get in touch! By the end of 2023, the Kolektivo Network aims to test multiple community economies around the world producing their own ecological assets.

Curaçaoan Locals

We invite merchants, NGOs, and local actors in the impact and environmental sectors to exchange goods and services, apply for grants, and join Kolektivo Curaçao.

ReFi and Impact DAOs

The Kolektivo Framework is a technology-agnostic suite whose main objective is to empower local communities to launch, finance, and govern their own regenerative economies. If you are working on a mission-driven product or protocol in the Web3 ReFi or impact sectors, let's collaborate.



References and Appendixes

Key References

The Kolektivo Whitepaper	Originally published 2021; a natural language specification describing decentralized exchange trading systems, a type of crypto-institutional assemblage that fulfills the requirements of local regenerative economies.
MVP Monetary System Specification	A technical specification of the MVP's monetary technologies.
MVP Governance System Specification	A technical specification of the MVP's governance technologies, namely, the BAC module.

Key Readings

As a collection of institutional technologies, the Kolektivo Framework sits at an interdisciplinary intersection between multiple academic fields and practices. The following readings offer key insights and contextualize the Framework for the unfamiliar.

Blockchains and the Economic Institutions of Capitalism	A keystone paper establishing Web3 as an institutional technology.	S. Davidson, Primavera De Filippi, J. Potts (2018)
A Decade of Adaptive Governance Scholarship	Adaptive governance is an emergent form of environmental governance coordinating resource management in a rapidly changing world. This paper is a summary of the field.	Chaffin, B. C., H. Gosnell, B. A. Cosens (2014)
Towards Regenerative Supply Networks	A proposed design framework for regenerative supply networks — supply networks deeply coupled to their local environmental milieu.	V. Souza, J. Bloemhof-Ruwaard, M. Borsato (2019)
Web3 Natural Capital Asset Taxonomy	A proposed taxonomy for natural capital or ecological crypto-assets in Web3.	Curve Labs (2022)
Finance 4.0—A Socio-ecological Finance System	An anthology evaluating and proposing cryptoeconomic and Web3 primitives for the effective management and incentivization of SES.	M. C. Ballandies, M. M. Dapp, B. A Degenhart, D. Helbing, S. Klauser & A. Pardi (2021)
Celo: Building a Regenerative Economy	A substantive online exposé detailing the Celo ecosystem's ambitions to lead regenerative economics in Web3.	Packy McCormick (2022)
Sustainable Governance of Natural Resources	An empirical monograph evaluating and ranking the most important factors and metrics determining SES success.	Ulrich Frey (2020)