Nori Carbon Removal Marketplace

Section 1: Summary

Use Case Summary			
Use Case ID:	IND-004	**Use Case Type:**	Agriculture, Finance, Data Validation
Submission Date:	March 19, 2019	**Is Use Case supporting SDGs**	Yes
Use Case Title:	Nori carbon removal marketplace	**Domain:**	Finance
Status of Case	Pilot	**Sub-Domain**	P2P transactions
Contact information of person submitting/ managing the use-case	Ross Kenyon Lead Strategist ross@nori.com https://nori.com		
Proposing Organization	Nori LLC, Washington, United States		
Short Description	Nori is building a new marketplace to incentivize the removal of carbon dioxide from the atmosphere.		

Long description	Nori is a carbon removal marketplace. We focus exclusively on helping carbon removal practitioners get paid for removing CO_2 from the atmosphere. Existing carbon markets primarily focus on avoided emissions. We have learned a lot from their experience but have made a number of design choices that we believe improves credibility, efficiency, and deservedly treats carbon removal as a discrete activity. Our technology and carbon removal methodologies are open source, and we have open our first pilot project for farmers engaging in regenerative agriculture. As a result of carbon removal's mechanics and the transparency of blockchain accounting, we can far more credibly guarantee that a tonne of carbon dioxide removed and represented by a Carbon Removal Certificate is actually removed. Our NORI token trades at a ratio of 1:1 against the CRC, which will create a market-driven price on carbon for the first time in history, something akin to the Brent Crude or West Texas Intermediate prices used for forecasting in petroleum. A simple and scalable system that allows even small carbon removers to monetize their activity could see the emergence of a trillion dollar carbon removal industry.		
SDG in Focus (when applicable)	#13.1, 13.2, 13.3, 13.A, 13.B		
Value Transfer:	NORI is a token acting as a medium of exchange that will be traded representing the global price for a metric tonne of carbon dioxide removed from the atmosphere. It is traded 1-to-1 for a non-fungible token called a Carbon Removal Certificate (CRC) that is immediately retired upon purchase.	**Number of Users:**	Including employees, those in the pilot, and those at companies we collaborate with, <100. Our ultimate goal is to be "The API for reversing climate change" with billions of users interacting with the system in the backend of everyday transactions.
Types of Users:	Supplier, Buyer, Verifier, Baseline generator, Peer reviewer, Data platform provider, Data manager, CRC aggregator.		

Stakeholders	There are two broad groups of stakeholders: those benefitting from less climate change (or a fully pre-Industrial Revolution climate), and those being paid for carbon removal behaviors. As a result of there being a single market-driven price for carbon removal, this could proportionally benefit the Global South more than those more-developed countries.
Data:	Carbon Removal Certificates will include metadata about who removed the CO2, where it was removed, how it was removed, who verified it, what standards it was verified against, who purchased the CRC, how much they paid.
Identification:	CRCs will be transparent, so the sellers and buyers will be public. Certain data about the carbon removal, such as farming practice data, will be kept confidential.
Predicted Outcomes:	Our goal is to provide the market mechanism for the future trillion dollar carbon removal industry. With a market-driven price on carbon dioxide, and a credible marketplace that is software-driven and scalable, we think this could cause a gold rush into carbon removal technology. At a more basic level, an outcome we expect is that carbon removal will be treated as discrete from offsets, which is crucial for carbon removal to grow into its own dedicated financial infrastructure.

Overview of the Business Problem or Opportunity
There is no marketplace that treats carbon removal as discrete from avoided emissions credit. But they are not the same and should not be treated as such. Additionally, we are past the point where emissions reductions, cap and trade allocations, avoided deforestation credits, and RECs can prevent climate change. With the trajectory we are currently on, we need carbon removal and we need it immediately. By building financial infrastructure that is simple and scalable, and assets that are trustworthy and make a credible impact on climate change, there is a huge opportunity to defuse political fighting over the environment vs. the economy. If people can become wealthy by practicing carbon removal, then we can grow the economy while also reversing climate change. Our approach to this financial infrastructure is software-driven and should be as easy to use as we have come to expect from ecommerce giants like Amazon. Our technology cuts out the large number of middlemen in legacy carbon markets, and can plug into the backend of many other applications through an API.
Why Distributed Ledger Technology?

Trust: The main reason blockchain is needed is for verification of who owns the Carbon Removal Certificate at what time. Public databases can provide transparency, but when you combine the transparency of the public ledger with the verifiability of records that cannot be tampered, corrupted, or bribed via the blockchain, you have something truly unique and valuable.

Provenance:

In carbon markets today, there is rampant double-counting and fraud. Companies routinely count emissions reductions against their carbon emissions after someone in their supply chain has done the same thing.

In the Nori market, there can only ever be one owner at a time of a Carbon Removal Certificate (CRC). Once the supplier sells it to a buyer, it becomes non-transferable, and can never be sold again. No longer can buyers of these certificates claim emissions reductions that were paid for by someone else. Whoever owns the CRC is the entity who can claim publicly that they've been responsible for removing a tonne of CO_2.

The same goes for suppliers. It is often the case that suppliers count their projects that reduced carbon emissions for themselves, and then sell offset credit to a buyer who also counts the emissions. In the Nori market, after a supplier sells a CRC, they no longer own it, and cannot claim that they have removed CO_2 in their own emissions report.

It would be possible to do this in a centralized database. But that's exactly what the current carbon registries use, and yet somehow the double-counting continues. By building this application on a blockchain, everyone involved can completely trust that there is only one owner of the CRC.

Insurance pooling: Of the 500 million NORI tokens which we plan to mint, they will belong to different categories of stakeholders. The most relevant category here is the insurance pool. In legacy carbon markets, if someone buys certificates that turn out to have released the carbon they attempted to remove or avoid emitting, the buyer would be on the hook for replacing those. We take that risk ourselves. We have an insurance pool set aside of 100 million tokens to replace any invalid CRCs for the benefit of buyers. We are able to build this mechanism into our market because of our control over token supply and its mechanics for the benefit of our users.

Operating, not Brokering: By using smart contracts, Nori is able to take a role whereby we never actually take ownership of the CRCs. We have developed our own open-source framework for an atomic swap marketplace. This enables the seamless transfer of the CRC for a NORI token between buyer and seller. All without Nori ever touching either asset.

This is partially useful to Nori so that we avoid any regulatory requirements that exist for brokering in a commodity like the CRC. But this is also a benefit to the users of the platform. They can trust—because of the open-source nature of the smart contract—that the exchange of NORI for CRC is truly a bilateral agreement solely between the buyer and supplier.

Immutability, verifiability, and transparency are cornerstone values of what Nori is building.

Section 2: Current process

Current Solutions
There is no focus by legacy carbon markets on carbon removal, nor by other DLT projects, at least that are operational. There is the Ecosystem Services Market Consortium, and Indigo Ag's The Terraton Initiative, that are in development of various approaches to soil carbon sequestration. It probably makes the most sense here to detail the working of legacy offset markets.

Existing Flow (as-is)		
Step	**User Actions**	**System Actions**

Process scheme (as-is)

Figure 1: The Offset Cycle, from Project Development to Retirement
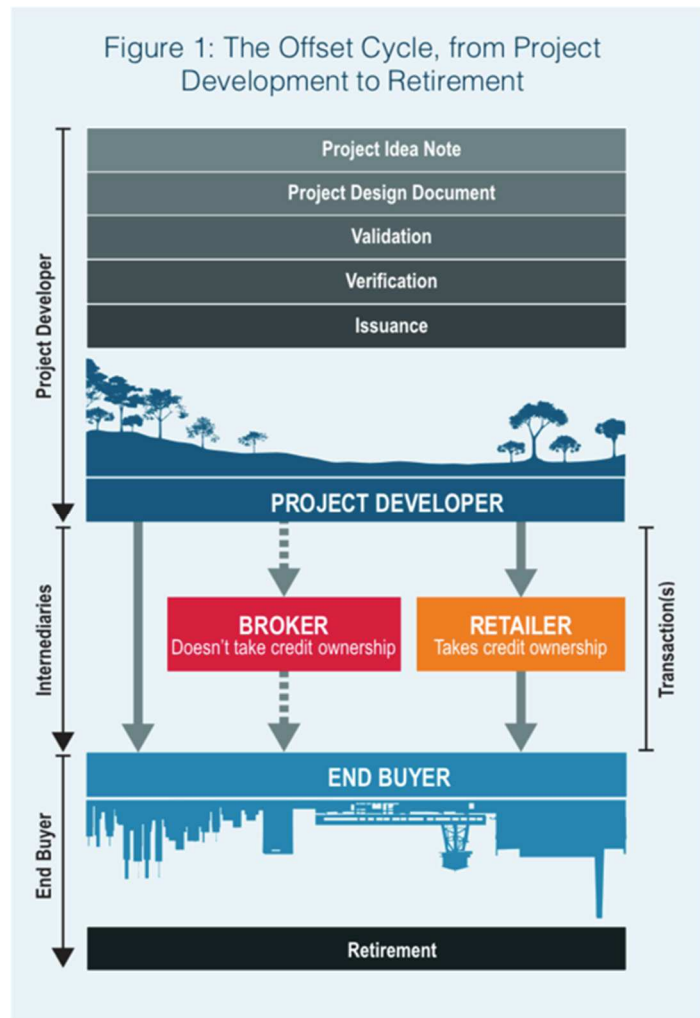
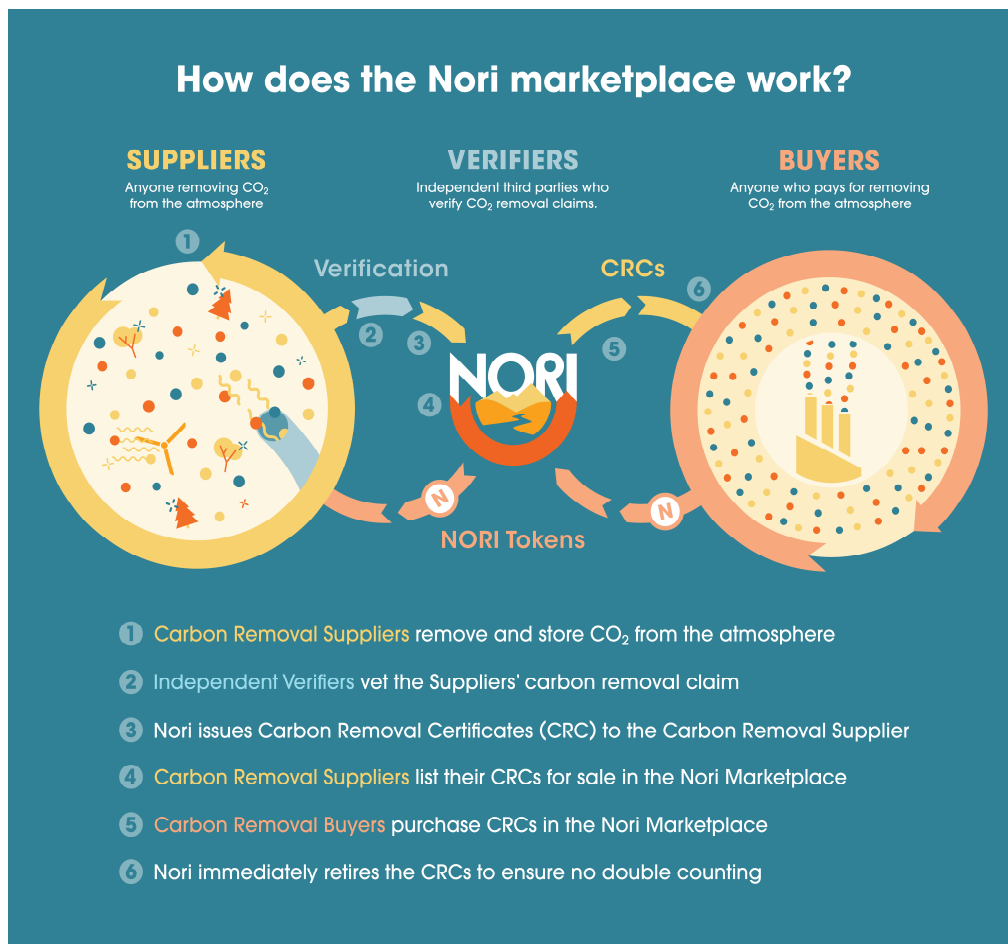| Data and information (as-is)		
Data	**Type**	**Description**
1	Offset protocol	A set of rules and descriptions of what constitutes a specific carbon offset project as well as how it is to be measured and verified.
2	Carbon offset credit	A certificate that purports to represent 1 tonne of CO_2-equivalent avoided emissions

Participants and their roles (as-is)		
Actor	**Type/Role**	**Description**
1	Corporate offset buyers	Typically sustainability officers at companies who purchase offset credits to meet voluntary or regulatory offsetting commitments.
2	Project developers	Developers of projects that avoid future GHG emissions.
3	Verifiers	Accredited people/companies who often co-develop a protocol for measuring avoided emissions.
4	Carbon registries	A group that maintains protocols for carbon offsets and lists of issued and sold offset credits.

Other Notes
It can be incredibly expensive for project developers to meet the requirements legacy carbon markets place on them for developing a protocol and paying for the listing and registration fees.

Section 3: Expected process

Expected Flow (to-be)		
Step	**User Actions**	**System Actions**
1.	Supplier removes carbon dioxide from the atmosphere	Supplier is issued unverified Carbon Removal Certificates
2.	Supplier gets carbon removal claim verified	Supplier's unverified CRCs become verified CRCs
3	Supplier lists CRCs for sale	CRC goes for sale
4	Buyer purchases CRCs	CRC changes ownership the Buyer. Supplier receives NORI tokens for CRCs. CRC is immediately retired in the Buyer's account.

Process scheme (to-be)

How does the Nori marketplace work?

SUPPLIERS
Anyone removing CO₂ from the atmosphere

VERIFIERS
Independent third parties who verify CO₂ removal claims.

BUYERS
Anyone who pays for removing CO₂ from the atmosphere

Verification CRCs

NORI

NORI Tokens

1. Carbon Removal Suppliers remove and store CO₂ from the atmosphere
2. Independent Verifiers vet the Suppliers' carbon removal claim
3. Nori issues Carbon Removal Certificates (CRC) to the Carbon Removal Supplier
4. Carbon Removal Suppliers list their CRCs for sale in the Nori Marketplace
5. Carbon Removal Buyers purchase CRCs in the Nori Marketplace
6. Nori immediately retires the CRCs to ensure no double counting

Participants and their roles		
Actor	**Type/Role**	**Description**
1	Suppliers	Suppliers sell CRCs to Buyers in exchange for NORI tokens. It's a way to monetize activities they might already be doing that are continuing to draw incremental CO2 out of the atmosphere, and to inspire new entrepreneurs and businesses to invest in carbon removal. E.g. Farmers, manufacturing companies, mining companies, universities, biofuel producers, technology startups, forest managers, etc.

Participants and their roles		
Actor	**Type/Role**	**Description**
2	Buyers	Buyers use NORI tokens to purchase CRCs, and receive verified certificates that prove carbon dioxide has been removed and stored. They can use these certificates for meeting carbon reduction obligations and for corporate social responsibility reports. E.g. Food producer companies, socially-responsible corporations, events/conferences/festivals, power utilities, local/state governments, individuals, etc.
3	Verifiers	Verifiers of CRCs are independent third-parties in positions of fiduciary responsibility who vet carbon removal claims made by Suppliers, and in turn get new opportunities to expand their professional services businesses through the development of innovative and more accurate methods for verifying CO_2 has been removed.
4	Baseline generators	The baseline generator takes in data about cropping and grazing practices. This includes information like what crop was grown, when it was planted, when it was harvested, how the land was tilled, how much fertilizer and lime was applied, and more. The baseline generator uses all this information plus other factors like traditional weather, temperature, and rainfall patterns, and national soil type maps, to model expected practice-driven changes in terrestrial organic and mineralized carbon stocks. Nori's first baseline generator is COMET-Farm, based in the NREL Laboratory at Colorado State University. Nori will add new baseline generators as they become known to us.
5	Peer reviewers	Similar to peer review committees for academic journals, peer reviewers are a collection of scientists, policy advisors, and industry experts who independently review, improve, and approve the Nori methodologies for measuring and verifying removed CO_2.

Participants and their roles		
Actor	**Type/Role**	**Description**
6	Data platform providers	Providers of some form of software platform used to collect and store data that will make it easier for farmers to monitor soil health and participate in the Nori marketplace. Integration between these data platforms and Nori makes it easy for farmers to cost-effectively organize and transfer the data they need to supply to get paid for increasing carbon content in soils and drawing down atmospheric CO2.
7	Data managers	Entities that directly help growers manage and interpret their data, register projects in the Nori marketplace, and submit carbon removal claims. Data managers act like independent consultants to farmers. Most data managers operate data platforms, but not all data platform operators provide data management and interpretation services to their platform users.
8	CRC aggregators	Entities that have been assigned ownership of and the right to manage a portfolio of CRC-generating projects on behalf of farmers.

Data and information		
Data	**Type**	**Description**
1	Cropping practice data	Farmers provide cropping practice data to Nori that gets run through the COMET-Farm model. This data remains private and confidential to the farmer.
2	Carbon Removal Certificate	Each CRC will be a non-fungible token that includes such metadata as who removed the CO2, where it happened, how it was verified and by whom, etc.
3	Buyer dashboard	Each Buyer will have a public dashboard that displays information about the CRCs they've bought, where users can then trace back all the information about the CRC.

Data and information		
Data	**Type**	**Description**
4	CRC purchase data	Every CRC purchase will take place on-chain. Volume and price bid data from our forward contract auctions will be published publicly.

Security and privacy
It is important to farmers that their cropping practice data remain private, as that is effectively their trade secrets. Metadata about the CRC will all be public.

Main Success Scenario + expected time line
We project launching our market in late 2019 with 1–2 million CRCs available for sale. Success entails buyers purchasing CRCs at high enough price levels that more farmers are incentivized to continue registering their projects in the Nori marketplace. Long term, Nori's goal is for the NORI token to become a reference price for CO_2 removal. We want to see the value of what buyers are willing to pay for carbon removal increase so that more and more entrepreneurs, farmers, businesses, and researchers invest time and money in increasing carbon removal capabilities, beyond soil sequestration which is Nori's starting point.

Conditions (pre- or post-)

Performance needs

On-chain transactions will occur infrequently. In a future state of many sensors reporting into the platform carbon removal activity, we will offload that onto a side chain application.

Legal considerations

For each issue, please describe the name of the legal act containing the identified barrier, what is the negative impact and a proposal to overcome this negative impact.

1. The US SEC has issued some dictum for how cryptocurrencies will be treated, but it is an ongoing process. We have made modifications to our token design to be more compliant with existing regulations.

2. The international community is currently debating new reporting standards and frameworks for international carbon trading. We are forming an exploratory group called Carbon Removal Action Group (CRAG) so that interested parties who wish to see carbon removal treated as distinctly different from carbon offsets have a more unified voice in international climate and policy discussions.

Risks

Legal risk: It is unclear if and how regulation surrounding digital assets will evolve, in their operational elements or financial categorization.

Business risk: It is possible that a different platform supersedes us in some way. Or that national or international policy will recognize carbon removal and assets representing it in a way which disfavors or excludes Nori from participation.

Technical risk: Beyond the risks basic to software companies, there is a dependency upon the Ethereum blockchain and its continued growth, robustness, and security.

Special Requirements

External References and Miscellaneous

Nori white paper: https://nori.com/white-paper

Nori blog: https://nori.com/blog

Other Notes

Nori's source of revenue is in a small transaction fee charged to the Buyer. We will not be charging listing or registration fees to the Suppliers.

Appendix 1:
Domains and subdomains for use cases categorization

Vertical:

1. Finance

    a. Financial management & accounting

    b. International & interbank payments

    c. Clearing and settlement

    d. Reduction of Fraud

    e. Financial messaging

    f. Asset lifecycles and history

    g. Trade finance

    h. Regulatory compliance & audit

    i. AML/KYC

    j. Insurance

    k. Peer-to-peer transactions

2. Healthcare

    a. Pharma

    b. Biotechnology

    c. Medicine

3. Industries

    a. Manufacturing

    b. Energy

    c. Chemical

    d. Retail

    e. Real estate

    f. IT and telco

    g. Supply chain management

    h. Transportation

    i. Agriculture

4. Government and public sector

    a. Taxes

    b. Government and non-profit transparency

    c. Legislation, compliance & regulatory oversight
    d. Voting

    e. Taxation and customs

    f. Intellectual property management

    g. Land Registries

Horizontal:

1. Identity management

2. Security management

    a. Public Key Infrastructure

3. Internet of Things

4. Data processing, storage and management

    a. Data Validation (includes provenance)

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