A REPORT

BLOCKCHAIN FOR SUSTAINABLE BUSINESS USE CASES

Report prepared by

DFINITY

INACTA VENTURES

Purpose of this report

The purpose of this report is to provide a comprehensive and detailed overview of 10 sustainability use cases that could potentially be enabled by the Internet Computer blockchain, developed by the DFINITY Foundation.

Authorship

This report has been prepared by the DFINITY Foundation and Inacta Ventures teams.

Contributors

INACTA VENTURES

'In the rapidly expanding realm of blockchain, the challenge lies in identifying protocols that not only enhance digital efficiency and security but also significantly contribute to sustainability. The impact of blockchain on achieving a more sustainable future is immense, offering innovative solutions to long-standing environmental and social challenges.'

Tom Rieder, Blockchain Advisor

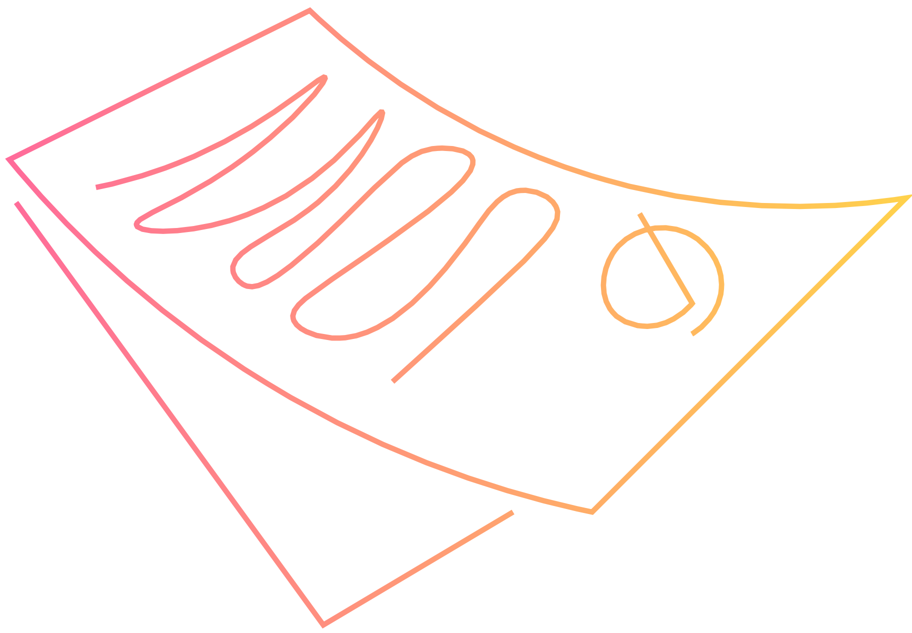
DFINITY

‘This report serves as a bridge between the technological prowess of blockchain and the pressing need for sustainable practices. It aims to enlighten and guide stakeholders from various sectors on harnessing this innovative technology to address some of the most critical challenges of our time, paving the way for a more sustainable, transparent, and equitable world.’

Aisling Connolly, Senior Research Scientist

Executive summary

In an era where sustainability is not just a choice but a necessity, this report, a collaborative effort between the DFINITY Foundation and Inacta Ventures, embarks on an exploratory journey to assess the transformative potential of blockchain technologies in driving sustainable practices. The core purpose of this initiative is to take a look at the vast landscape of sustainability to identify and analyze projects that could substantially benefit from the integration of blockchain technologies, particularly the Internet Computer network. The scope of this assessment extends to evaluating the sustainability and profitability of potential business models within this paradigm.



The report has identified 10 use cases:

1. **Impact investing marketplace**
   Marketplace for impact investments, connecting investors with projects that have positive social and environmental outcomes.

2. **Carbon credit game app**
   Gameplay to save the planet by converting revenues (in-app purchases, premium features, and advertising) into carbon credits.

3. **Token-based carbon credit trading platform**
   Enterprise token marketplace for carbon credits, carbon credit trading with NFTs.

4. **Carbon credit leveraging**
   DeFi platform to allow leveraging against carbon credits and liquidity mining approach with carbon credits.

5. **On-chain certificate for audited SDG projects**
   Blockchain can automate the reporting of ESG/SDG metrics. This could make it easier for organizations to demonstrate their progress towards their ESG/SDG goals.

6. **Reporting & certifications**
   Bring reportings on chain. For example: GRI, CDP, B-Corp, EU CSRD (hashing of certifications).

7. **Crypto donation platform**
   A crypto donation ecosystem, crypto donation solution, which provides an ecosystem for nonprofits and charities to fundraise Bitcoin and other cryptocurrencies, be found by crypto donors, and receive funds instantly.

8. **Power consumption monitoring**
   Blockchain can be integrated with smart meters to enable various applications in the smart grid framework.

9. **Supply chain carbon consumption calculation**
   Measuring, automating, and proving your product carbon footprint besides your corporate footprint across the entire life cycle .

10. **Pollution monitoring platform**
    IoT device that monitors data through sensors in different scenarios. Sensor owners are rewarded with coins. Computing of data and visualizing through ICP for water, air, soil, or electric waves/radiation.

These use cases can be categorized under five key domains:

Financing

Platforms

Monitoring

Marketplaces

Certification

Each category is examined through the lens of blockchain technology, with a special focus on how these applications can revolutionize traditional practices. The emphasis is on leveraging the inherent transparency of blockchain, addressing a critical gap in the current sustainability space where much of the information is unverifiable. This transparency not only fosters trust but also ensures accountability in sustainable practices.

Additionally, the report delves into the unique capabilities of the Internet Computer network, highlighting its efficiency and how it stands as a beacon of innovation in the blockchain world. The Internet Computer's advanced features offer unprecedented opportunities for scalability and sustainability in business models, setting a new benchmark in the industry.

A significant aspect of this report is the collaboration between DFINITY, with its deep understanding of the Internet Computer, and Inacta Ventures, renowned consultants in the distributed ledger technology (DLT) and sustainability space. This partnership brings together technical expertise and industry insights, ensuring a comprehensive and nuanced exploration of the possibilities presented by blockchain in sustainability.

In conclusion, this report provides a roadmap for businesses and organizations looking to harness blockchain technology for sustainable development, marking a significant step towards a more transparent, trustworthy, and efficient future. This report is envisioned to be a guiding light for stakeholders across various sectors, motivating them to embrace blockchain technologies in their pursuit of a sustainable and profitable future.

Blockchain x Sustainability

the bridge for change

In today's rapidly evolving digital era, the emergence of blockchain technology represents a paradigm shift, redefining the concepts of trust and collaboration in our global systems. Born from the need to eliminate central points of trust in critical systems, blockchain technology has proven exceptionally effective in providing a platform for building tamper-proof, trustless applications. Its low barriers to entry make it faster, cheaper, and easier to develop solutions compared to traditional platforms. Beyond its initial financial applications, blockchain's inherent architecture excels as a coordination tool, particularly in projects requiring social collaboration. Coupled with its transparency and verifiability, blockchain emerges as a powerful tool for a wide range of projects, especially those demanding collective effort in leveraging finance and technology.

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'The emergence of blockchain technology represents a paradigm shift, redefining the concepts of trust and collaboration in our global systems.'

Aisling Connolly, Senior Research Scientist

Simultaneously, the importance of sustainability is escalating in our collective consciousness. Increasing legislative requirements and investment norms are driving the need for transparent reporting of sustainability practices. This trend is magnified by the urgency of the climate crisis, which demands significant reductions in emissions to avoid catastrophic tipping points. A critical challenge in addressing this crisis lies in the lack of clear, verifiable data on emissions, making it difficult to formulate effective strategies. The sustainability sector is also grappling with the need for full traceability in carbon credits and proof of genuine mitigation practices.

Given the challenges in the sustainability space, and the solutions that blockchain technology offers, it becomes crucial to explore how to build appropriate solutions. This report, crafted by experts who are well versed in both the technology and the industry, aims to provide insights on leveraging blockchain's trustless, tamper-proof, and transparent architecture to achieve sustainability goals.

It is important to clarify our interpretation of sustainability in this context. We approach it broadly, encompassing not only climate and green technology but also the sustainability of businesses. Our objective is to ensure that green tech businesses are not just environmentally sound but also economically viable and long-lasting.

In our assessment of sustainability projects, we align with the United Nations Sustainable Development Goals (SDGs), providing a comprehensive and globally recognized framework for measuring impact. Each use case in this report is juxtaposed with relevant UN Goals, offering readers a clear understanding of how blockchain applications can contribute to these broader objectives. Additionally, we incorporate the Environmental, Social, and Governance (ESG) framework, providing a holistic view of sustainability that transcends mere environmental factors.

This report serves as a bridge between the technological prowess of blockchain and the pressing need for sustainable practices. It aims to enlighten and guide stakeholders from various sectors on harnessing this innovative technology to address some of the most critical challenges of our time, paving the way for a more sustainable, transparent, and equitable world.

Use Case Study
Blockchain innovations in sustainability

In our comprehensive study of the current landscape and emerging trends in sustainability-focused projects, we have identified five key categories where blockchain technology, particularly the Internet Computer, has the potential to make a significant impact. These categories represent the diverse areas in which blockchain can facilitate sustainable development and address environmental challenges.

Platforms

This involves the use of blockchain to create platforms that facilitate various sustainable activities, such as carbon footprint tracking, sustainable resource management, or community engagement in environmental initiatives. These platforms can harness the power of decentralized networks to foster collaboration and shared responsibility.

Marketplaces

Blockchain technology can revolutionize sustainable marketplaces, providing platforms for the exchange of eco-friendly goods and services. These marketplaces benefit from the transparency and trust that blockchain offers, ensuring ethical and sustainable practices in the trade of goods and services.

Monitoring

Blockchain can be effectively used for environmental monitoring, tracking various parameters like air quality, water quality, or wildlife movement. This real-time, tamper-proof data collection is crucial for informed decision-making and policy development in environmental management.

Certification

In the realm of sustainability, certification is crucial for verifying and validating eco-friendly products, practices, or companies. Blockchain's immutable and transparent nature makes it an ideal tool for certification processes, ensuring authenticity and trust in sustainability claims.

Financing

This category encompasses projects that leverage blockchain for green financing, such as funding renewable energy projects, sustainable business ventures, or community initiatives.

Structure of Each Use Case

Each use case within these categories follows a structured format to provide a clear and comprehensive understanding of how blockchain technology is being utilized:

Use Case Title
A concise statement summarizing the main focus or theme of the use case.

Scope
Outlines the extent, range, and boundaries of the project or solution covered in the use case.

Revenue Stream
Describes the primary sources of income and financial model that will sustain the use case.

Regulatory Framework
Details the legal and regulatory considerations and compliance requirements relevant to the use case.

Go to Market Approach
Summarizes the strategy for launching and promoting the solution or project to the target market.

Open Problems
Identifies and describes any unresolved challenges or issues that the use case needs to address.

Blockchain Components
Outlines the specific DLT elements and features utilized in the use case.

Business Case
Provides a rationale for the use case, explaining its viability, benefits, and value proposition to stakeholders.

By exploring these use cases, we aim to showcase the innovative ways in which blockchain can be a catalyst for sustainable development across various sectors and initiatives, highlighting its potential to revolutionize our approach to environmental conservation and sustainability.

Leveraging Blockchain Components in the Sustainable Business Use Cases

In building sustainable businesses, blockchains present a suite of transformative components, each playing an important role in enhancing transparency, efficiency, and collaboration. This chapter takes a look at the key features of blockchains that are instrumental in driving sustainability.

Notably:

- The ecosystem that can be leveraged
- The fact that they have a shared ledger
- Decentralization
- Automation
- Digital assets
- Token economies

Each component contributes uniquely to the creation and operation of sustainable business models, offering innovative solutions to traditional challenges.

Ecosystem

Refers to the collaborative network of participants, including businesses, consumers, and technology providers, all interconnected through blockchain networks. This ecosystem fosters mutual growth and innovation, crucial for sustainable development.

Automation

Through smart contracts and other automated processes, blockchains can streamline operations, reduce errors, and ensure the efficient execution of agreements. This automation is key to scaling sustainable practices and reducing footprints.

Shared Ledger

Acts as a tamper-proof record of transactions and interactions, ensuring transparency and trust among all participants in the ecosystem. This shared data repository is fundamental to verifying sustainable practices and claims.

Digital Assets

Encompasses the creation, management, and exchange of digital forms of value or rights, facilitating new models of sustainable finance and resource management.

Decentralization

Eliminates the need for central authorities, distributing control among all participants and enhancing the system's resilience and fairness. This decentralization empowers participants and supports equitable sustainable initiatives.

Token Economies

Utilizes digital tokens to incentivize and manage behaviors within the ecosystem, promoting sustainable actions and rewarding participation in green initiatives.

All sustainable business ideas can leverage many of these components, but some are more crucial than others. For each use case, we provide specific examples of how these blockchain components are utilized to address sustainability challenges, demonstrating their practical application and impact. By integrating these components into their operations, businesses can not only enhance their sustainability efforts but also unlock new value and opportunities in the green economy.

Use Cases

All sustainable business ideas can leverage many of the components listed above, but some are more crucial than others. For each use case, we provide specific examples of how these blockchain components are utilized to address sustainability challenges, demonstrating their practical application and impact. By integrating those components into their operations, businesses can not only enhance their sustainability efforts, but also unlock new value and opportunities in the green economy.

Blockchain Components

Ecosystem

Shared Ledger

Decentralization

Automation

Digital Assets

Token Economies

Impact Investing Marketplace

Go-to-market approach

Market Research and Analysis

- Identify the target audience, including businesses, organizations, and investors interested in Impact investing
- Identify and onboard projects

First Steps

- Platform development and testing
- Onboard pilot projects

Preconditions

- Standard onboarding process inc. legal & compliance

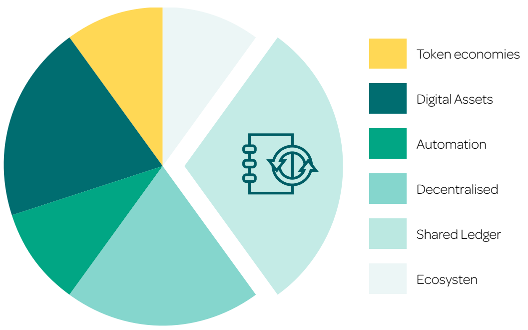
Ecosystem Partners

- Auditing companies
- Projects owners
- Investment funds

Blockchain Component

Shared Ledger

- Having a shared ledger in an impact investment marketplace ensures unparalleled transparency and trust, facilitating verifiable tracking of investments and their environmental or social impacts.



Description

- A decentralized marketplace for impact investing connects investors with sustainable projects. It is built on Internet Computer Protocol (ICP), which provides transparency and accountability for sustainable investments. ROI could also include carbon credits

Ultimate Goal

- Mobilize funds for sustainable development projects
- Channel investment into SDG sectors
- Maximize positive impact

Revenue Stream

Use case potential

L

Financial Benefit

- Time to market: 6-12 months
- Execution readiness: 3-6 months
- Transactions: 25-50m
- Confidence Level: Medium

Regulatory Framework

- Financial regulations – AML, KYC, Prospectus requirements to fulfill
- Anti-fraud regulations – how to prevent and detect fraudulent activities
- Data privacy laws to ensure users personal and financial data is managed in a secure and protected way
- Commodity trading laws need to be adhered to

Carbon credit gaming app

Go-to-market approach

Identify Key Stakeholders

- Main target audience – environmental enthusiasts, educational institutions, eco-conscious businesses

First Steps

- Market research and analysis of the competitive landscape
- Understand strength and weaknesses of existing environmental and gaming (non-blockchain) games
- Position product through definition of a unique value proposition – highlight what sets the carbon credit game apart from other apps
- Align game's features with interests and needs of target audience

Preconditions

- Regulatory compliance in target jurisdiction

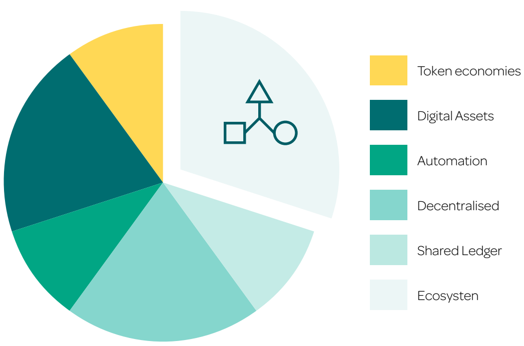
Ecosystem Partners

- Environmental organizations, educational institutions, thought leaders

Blockchain Component

Ecosystem

- A carbon credit game app for carbon offset projects can benefit individuals, corporations (eco-consciousness), and educational institutions. All these entities can convert revenues into carbon credits.



Description

- Carbon credit gaming app on ICP that combines education, entertainment, and the ability to earn and utilize carbon credits
- Virtual world that simulates real-world scenarios related to carbon reduction and sustainability

Ultimate Goal

- Access to mass market through gamification
- Platform serves as educational tool, a game, and a marketplace for carbon credits
- Create a cost-covering and sustainable business model promoting CO2 reduction on a global scale

Revenue Stream

Use case potential

L

Financial Benefit

- Time to market: 3-6 months
- Execution readiness: 3-6 months
- Transactions: < 25m
- Confidence Level: Medium

Regulatory Framework

- Compliance with internationally recognized carbon offset standards (e.g., Verified Carbon Standard (VERRA), Gold Standard, Clean Development Mechanism)
- Compliance with data privacy laws (DSG, GDPR)
- Gambling regulations in case of game of chance features
- Ensure compliance with financial regulations (KYC/AML) – threshold based

Token-based carbon credit trading platform

Go-to-market approach

Market Research and Segmentation

- Understand target audience including their sustainability goals and preferences for offsetting emissions

First Steps

- Specify concept, value proposition as well as products and services
- Build the platform ensuring smart contract compatibility, scalability, tokenization with NFTs, accessibility to a wide range of participants (Individuals, SMEs)

Preconditions

- Ensure compliance and certification with international carbon credit standards

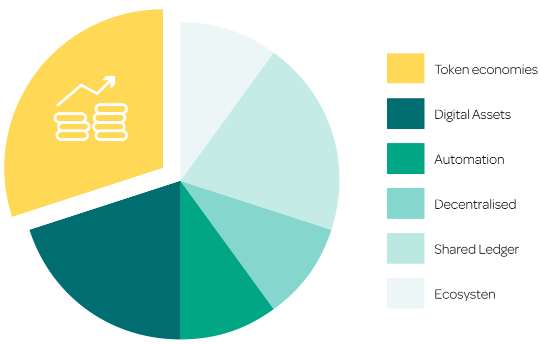
Ecosystem Partners

- Organizations developing and managing carbon offset projects

Blockchain Component

Token Economies

- Token economies incentivize sustainable behaviors and facilitate the efficient, transparent exchange of carbon credits, driving participation and investment in carbon reduction initiatives.



Description

- Token-based trading platform that facilitates the trading and verification of carbon offset credits using NFTs
- Carbon credits represent a quantified reduction in greenhouse gas emissions

Ultimate Goal

- Create a transparent, secure, and efficient ecosystem for buying and selling carbon offset credits
- Leveraging ICP (hardware + software) + NFT technology to facilitate trust and security

Revenue Stream

Use case potential

XL

Financial Benefit

- Time to market: 6-12 months
- Execution readiness: 3-6 months
- Transactions: > 50m
- Confidence Level: Medium

Regulatory Framework

- Adherence to established carbon credit standards such as Clean Development Mechanism (CDM) or Verified Carbon Standards (VCS)
- Compliance with data privacy laws (DSG, GDPR)
- Ensure compliance with financial regulations (KYC/AML)
- Consider tax implications per jurisdiction (income tax, VAT, capital gain tax) as well as compliance with reporting of carbon credit transactions

Carbon credit leveraging

Go-to-market approach

Market Research and Analysis

- Identify the target audience, including businesses, organizations, and investors interested in carbon credits
- Identify and onboard partners with reputable carbon-credit projects

First Step

- Platform development and testing

Preconditions

- Regulatory compliance and licenses need to be in place

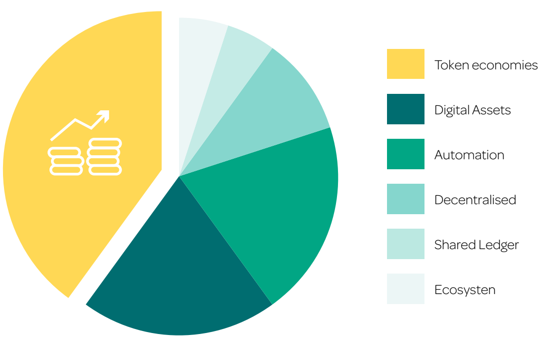
Ecosystem Partners

- Auditing Companies
- Projects

Blockchain Component

Token Economies

- Token economies integrate seamlessly with DeFi platforms, enabling automated, transparent, and decentralized trading of carbon credits, enhancing liquidity and market accessibility.



Description

- DeFi platform for carbon credit holders offering products and services for DeFi users
- Platform to allow leveraging against carbon credits
- Liquidity mining approach with carbon credits

Ultimate Goal

- Provide financial benefits for carbon credit holders
- Incentivize the acquisition and trading of carbon credits
- Create a relevant business model for the future

Revenue Stream

Use case potential

XL

Financial Benefit

Time to market:	6-12 months
Execution readiness:	3-6 months
Transactions:	> 50m
Confidence Level:	Medium

Regulatory Framework

- Financial regulations – AML and KYC requirements to fulfill
- Anti-fraud regulations – how to prevent and detect fraudulent activities
- Data privacy laws to ensure users personal and financial data is managed in a secure and protected way
- Commodity trading laws need to be adhered to
- Environmental Offset Registry Integration

On-chain certificate for audited SDG projects

Go-to-market approach

Identify Key Stakeholders

- Understand the key stakeholders, including ESG certification bodies, companies implementing SDG projects, investors, regulators

First Steps

- Pilot Programs – demonstrate the value of ICP-based system to key stakeholders
- Educate and train – teach organizations and individuals on how to use and interact

Preconditions

- Collaborations with SDG certifiers, industry associations and regulatory bodies aiming to get support and ensure acceptance

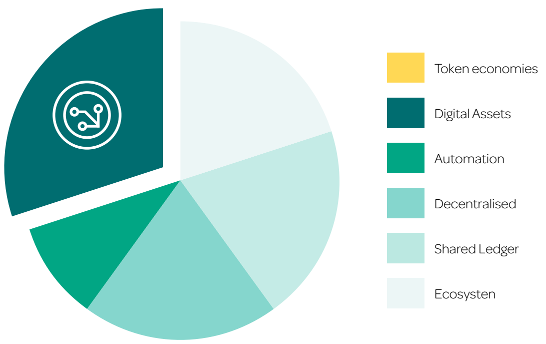
Ecosystem Partners

- Auditors, law firms

Blockchain Component

Digital Assets

- Digital assets ensure the authenticity, traceability, and secure transfer of certificates for audited SDG projects, enhancing credibility and stakeholder confidence.



Description

- ICP platform designed to verify and store information about projects that align with the United Nations' SDGs
- Transparent and secure way to verify the authenticity and impact of sustainability initiatives

Ultimate Goal

- Increase reliability by providing a transparent and immutable ledger of certified SDG projects
- Drive positive change in the realms of sustainability, corporate responsibility, and ethical governance

Revenue Stream

Use case potential

M

Financial Benefit

- Time to market: >12 months
- Execution readiness: >12 months
- Transactions: < 25m
- Confidence Level: Medium

Regulatory Framework

- Vary by jurisdiction and could involve compliance with a range of laws and regulations
- Data Privacy Regulations – e.g., Data Privacy Law (CH), GDPR (EU)
- Environmental Regulations – depending on the nature and scope (e.g., renewable energy, waste management or conservation efforts) of the SDG project
- Impact of regulation depend on different factors such as location

Reporting & certifications

Go-to-market approach

Identify Key Stakeholders

- Identifying non-/mandatory ESG Reporting standards and bodies,
- Understand the key stakeholders, existing Software Companies offering ESG reporting Tool as well as auditing Companies

First Steps

- Evaluating existing market entry strategies: make, cooperate, acquire

Preconditions

- Meet requirements of different frameworks: GRI, ESRS, IFRS, CDP, SBT

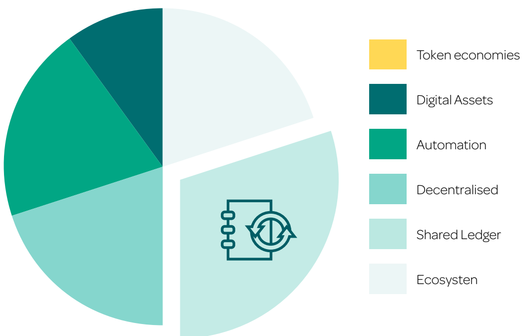
Ecosystem Partners

- Auditors, certification, and standard bodies

Blockchain Component

Shared ledger

- A shared ledger provides an immutable and transparent record for reporting and certifications, ensuring accuracy and trustworthiness in compliance and achievement documentation.



Description

- ICP platform designed to aggregate and integrate ESG-related corporate data (incl. supply chain) to easily report according to different ESG reporting standards such as GRI or ESRS

Ultimate Goal

- Making ESG reporting easy
- Bringing external audited ESG certifications on ICP

Revenue Stream

Use case potential XS

Financial Benefit

- Time to market: 6-12 months
- Execution readiness: >12 months
- Transactions: < 25m
- Confidence Level: Low

Regulatory Framework

- Increasingly, market growth will be fueled by the new Corporate Sustainability Reporting Directive (CSRD), which will become effective in 2024 and require the disclosure of standardized ESG topics by more than 50,000 companies in the EU.Three other geographies are introducing similar legislation, including the US, the UK, and Australia

Crypto donation platform

Go-to-market approach

Target User

- Donors/philanthropists and non-profit organizations able to receive donations in crypto assets
- Foundations willing to donate native tokens

First Steps

- Technical setup (platform, custody, network contacts, governance)
- Legal opinion in target markets

Preconditions

- Legal clarity about preconditions per legislation, as a donation platform provider and pre-requisites to receive and distribute crypto currencies

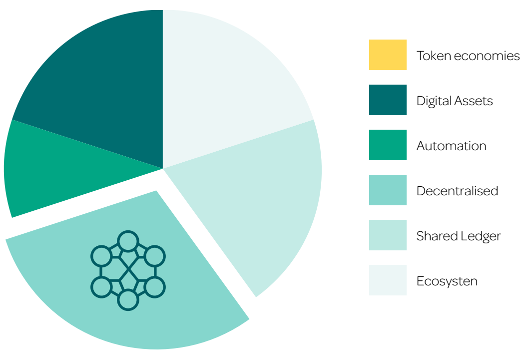
Ecosystem Partners

- Legal partners, Custody providers

Blockchain Component

Decentralized

- Decentralization ensures transparency, reduces the risk of fraud, and allows for direct, peer-to-peer donations, enhancing trust and efficiency in charitable transactions.



Description

- Fundraising platform dedicated to helping nonprofits raise donations more effectively
- Ecosystem for nonprofits and charities to fundraise Bitcoin and other cryptocurrencies, be found by crypto donors, receive funds instantly

Ultimate Goal

- Maximize Impact
- Achieve transparency and accountability
- Establish lower transaction cost
- Provide inclusivity for traditional and crypto

Revenue Stream

Use case potential

M

Financial Benefit

Time to market:	6-12 months
Execution readiness:	6-12 months
Transactions:	< 25m
Confidence Level:	Medium

Regulatory Framework

- Similar to donating equities or other appreciating assets, there can be significant tax advantages to donating cryptocurrency directly instead of selling it and donating the proceeds yourself
- Not all charities are eligible to receive cryptocurrency donations
- US - Internal Revenue Service (IRS) treats cryptocurrency donations as property donations
- CH - no specific regulation governing cryptocurrency donations.

Power consumption monitoring

Go-to-market approach

Identify Key Stakeholders

- IoT device/hardware manufacturers
- Utility companies
- Regulators and government authorities

First Steps

- Define scope, objectives, and goals
- Determine the system architecture and technology stack
- Conduct thorough assessment of the regulatory landscape (legal support)

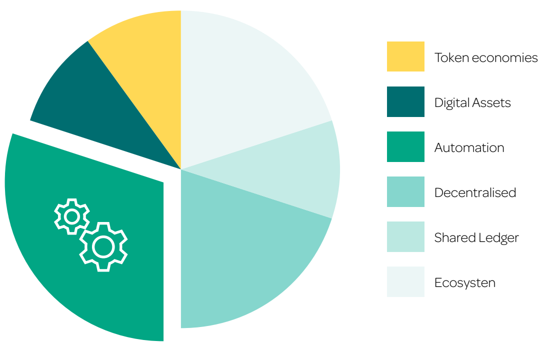
Preconditions

- Regulatory compliance, data privacy standards in place and user consent for data collection
- Test and ensure energy data accuracy (calibration of sensors and devices to provide reliable measurements)

Blockchain Component

Automation

- Blockchain automation enables transparent, real-time, and accurate monitoring and management of power consumption, optimizing energy use and contributing to sustainability efforts efficiently.



Description

- ICP platform designed to aggregate and integrate ESG-related corporate data (incl. supply chain) to easily report according to different ESG reporting standards such as GRI or ESRS

Ultimate Goal

- Promote sustainability, enhance energy efficiency, and contribute to a greener future
- Establish sustainable energy practices
- Manage energy distribution

Revenue Stream

Use case potential

M

Financial Benefit

- Time to market: 6-12 months
- Execution readiness: 3-6 months
- Transactions: > 50m
- Confidence Level: High

Regulatory Framework

- Data Privacy Regulations – e.g., Data Privacy Law (CH), GDPR (EU)
- Compliance with energy regulations and reporting standards
- Compliance with cybersecurity regulations and standards, such as NIST Cybersecurity Framework or ISO 27001
- Compliance with relevant standards and certifications, such as those established by the International Electrotechnical Commission (IEC) or the National Institute of Standards and Technology (NIST)

Supply chain carbon consumption calculation

Go-to-market approach

Identify Key Stakeholders

- Environmental organizations, government agencies, industry associations and consumers

First Steps

- Identify potential partnerships
- Focus on user-friendly and intuitive user experience
- Initiate a pilot program with early adopters to demonstrate effectiveness of the solution
- Determine pricing strategy that aligns with target audience

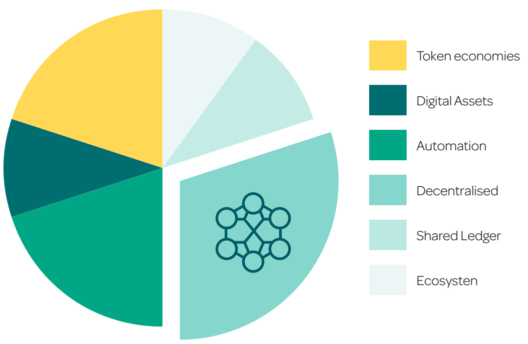
Preconditions

- Regulatory compliance with relevant environmental, data privacy, and financial regulations in target jurisdictions

Blockchain Component

Decentralized

- Decentralization ensures transparent, tamper-proof recording of supply chain carbon footprints, facilitating accurate and trustworthy consumption calculations.



Description

- Smart contracts can be used to implement a system that tracks and records various activities that emit carbon
- Incentivize carbon reductions through monitoring and contribute to global efforts for climate change

Ultimate Goal

- Identify carbon-emitting activities
- Define carbon measurement metrics
- Develop smart contract platform
- Provide data input and verify results

Revenue Stream

Use case potential

M

Financial Benefit

- Time to market: 6-12 months
- Execution readiness: 6-12 months
- Transactions: > 50m
- Confidence Level: Medium

Regulatory Framework

- Environmental compliance with local, national, and international environmental regulations and standards
- Data privacy regulations (SDG, GDPR)
- Compliance with reporting and disclosure requirements (e.g.; calculation schemes) for environmental standards per jurisdiction

Decentralized pollution monitoring platform

Go-to-market approach

Identify Key Stakeholders

- Local Environmental Authorities
- IoT sensor providers
- Research institutes

First Steps

- Pilot testing: Launch a small-scale pilot in a target region

Preconditions

- Regulatory Compliance: Ensure that the platform and sensors meet all necessary standards in the target market.

Ecosystem Partners

- Tech providers: Collaborate with companies specializing in IoT, data analytics,
- Research institutions: Partner with universities and research organizations for data validation, further research, and enhancing the platform's scientific credibility

Description

- A decentralized pollution monitoring platform employs IoT sensors to collect environmental data from various locations. Sensor owners, contributing to the data collection, are incentivized with coins or tokens.

Ultimate Goal

- Incentivize decentralized air, soil and water quality monitoring

Revenue Stream

Use case potential

M

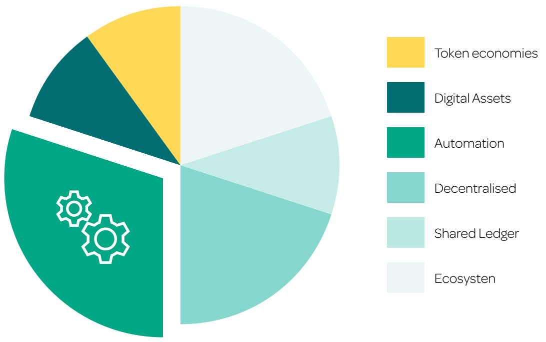
Financial Benefit

Time to market:	> 12 months
Execution readiness:	6-12 months
Transactions:	> 50m
Confidence Level:	Medium

Blockchain Component

Automation

- Automation facilitates continuous, real-time tracking and analysis of pollution levels, enabling quality level alerts, payment and transaction data, reporting and notifications



Regulatory Framework

- Compliance with data privacy: Ensure all data collection, processing, and storage adhere to global data protection regulations like GDPR, CCPA, and others. Obtain user consent where personal data is involved.
- Environmental standards: Align with local and international environmental standards and protocols, ensuring that the monitoring adheres to recognized benchmarks and methodologies.

At a glance overview

	Impact investing marketplace	Carbon credit game app	Token-based carbon credit trading plat-form	Carbon credit leveraging	On-cha certific for auc SDG pr
Time to Market	→	↑	→	→	↘
Execution Readiness	↑	↑	↑	↑	↘
Transactions	Medium	Low	High	High	Lo
Use Case Revenue	L	L	XL	XL	M
Confidence Level	Medium	Medium	Medium	Medium	Med

Wave 1

Wave 2

	Low	Medium	High
Transactions	<25m	25-50m	>50m
Confidence Level	<50%	50-75%	>75%

ain cate dited ojects	Reporting & certifications	Crypto donation platform	Power consumption monitoring	SC carbon consumption calculation	Pollution monitoring platform
↓	→	→	→	→	↓
↓	↓	→	↑	→	→
ow	Low	Low	High	High	High
M	XS	M	M	M	M
dium	Low	Medium	High	Medium	Medium

↑ 3 - 6 months
→ 6 - 12 months
↓ > 12 months

XS	S	M	L	XL
<1m CHF	1-5m CHF	5-15m CHF	15-20m CHF	>20m CHF

Challenges & Limitations

While blockchain technology offers transformative potential in the realm of sustainability, its implementation is not without challenges and limitations. Understanding these obstacles is crucial for developing effective and practical solutions. This section delves into the key challenges and limitations that stakeholders may encounter when leveraging blockchain for sustainability initiatives.

Technological Barriers

Scalability and Performance

Despite advancements, some blockchain networks still face scalability issues, struggling to handle a large number of transactions quickly and efficiently. This can be a significant hurdle for sustainability projects that require real-time data processing or support a large user base.

Interoperability

Many blockchain platforms operate in silos, with limited ability to interact with other systems and networks. This lack of interoperability can impede the seamless integration of blockchain solutions into existing sustainability frameworks and systems.

Energy Consumption

Certain blockchain models, particularly those based on Proof of Work (PoW), are energy-intensive. This can paradoxically conflict with sustainability goals, especially in projects aimed at reducing carbon footprints.

Regulatory and Compliance Issues

Uncertain Regulatory Landscape

The regulatory environment for blockchain is still evolving. In many regions, unclear or inconsistent regulations can create challenges for businesses and organizations looking to adopt blockchain for sustainability.

Compliance and Standards

Ensuring that blockchain solutions comply with existing standards and practices in sustainability can be complex. This is particularly challenging when dealing with cross-border projects, where regulatory requirements can vary significantly.

Blockchain Components
in Use Cases

	Ecosystem	Shared Ledger	Decentralised
Impact Investing Marketplace	Project developers Institutional investo	Token minting and transactions Dividend payouts verification	Registration and onboardi Project details Audit reports Compliance assessments
Carbon credit game app	Individuals Corporations (eco-consciousness) Educational institutions Carbon offset projects	Carbon credit transactions Carbon credit project information (project status) User data – user profiles and account information (user IDs, wallet addresses) Smart contracts	Carbon credit marketplace User activity (progress, achievements, rewards) Community interaction da Governance (data)
Token-based carbon credit trading platform	Carbon offset project developers Regulatory bodies Financial institutions Marketing and PR agencies	Carbon credit issuance, transfer and trading transactions NFT minting and transfer transactions Verification and audit results/ certifications User registration and onboarding transactions	Project details Audit reports Compliance assessments Data and impact reports o projects
Carbon credit leveraging	Carbon credit projects Traders, buyers and sellers Certification bodies, regulators and compliance entities NGO's and environmental organizations	Carbon credit details Transaction history User identities + digital signature and cryptographic proofs, hashes Trading + liquidity pools details	Market and trading pairs pr Carbon credit quantity Carbon credit price Settlement terms Transaction timing
On-chain certificate for audited SDG projects	Non-profit organizations SDG projects/organizations Certification bodies/regulators/ government bodies/standards organizations Investors/donors	Project certification transactions User and access control transactions Smart contract triggered certification Event and notification transactions	Project details Audit reports Compliance assessments Data and impact reports o projects

	Automation	Digital Assets	Token economies
ng	Smart contract interactions Environmental impact reporting transactions	NFTs Cryptocurrencies / stable coins Carbon credit tokens Platform-specific tokens	Token utility Burn mechanism
e listings ta	Smart contracts for carbon credit verification, transactions and verifications User reward mechanisms Carbon credit generation Authentication and verification of user data and access	Cryptocurrencies / stablecoins Carbon credit tokens / NFTs (collectibles, eco-friendly items or upgrades) Platform- or project specific tokens	Earn and burn mechanisms – carbon credits energy saving tokens, education credits Spend tokens – in-game purchases, virtual currency conversion
f certified	Smart contract interactions	NFTs Cryptocurrencies / stablecoins Carbon credit tokens Platform-specific tokens	Token per carbon credit entity Define token utility and use cases (e.g.; platform fees, governance participation, rewards) Burn mechanism
ices	Smart contract execution Identify verification (KYC/AML) Market data updates (real-time carbon credit pricing) Settlement and payment processing	Carbon credit tokens Payment tokens/stablecoins Utility tokens (enable trading, pay for transaction fees, access to premium features)	Rewards and incentive mechanism to verify and validate carbon credit tokens or to promote carbon-friendly behavior Governance tokens to grant users access to the decision-making process
f certified	Certification process Compliance assessment (project/ ecosystem member eligibility, auditor credential) Verification of eligible ecosystem members Access rights and roles	NFTs as proof of eligible projects Cryptocurrencies and/or stablecoins as payment method for e.g., accessing reports Utility tokens to provide access to certain functionalities (participating in governance process)	Not applicable for this use case (at least in a first concept phase)

Blockchain Components
in Use Cases

	Ecosystem	Shared Ledger	Decentralised
Reporting & certifications	Issuing bodies GRI, EFRAG, ISO Auditing companies: BDO, PWC, Enterprises which must report Investors, analysts	Reportings Smart contracts triggering certification steps based on pre-defined criteria Event and notification transactions	Certifications Audit reports Compliance assessments Supply Chain relevant data
Crypto donation platform	Donors/philanthropists Non-profit organizations Protocols Projects/startups	Transactions (Wallet) Balances Certification of non-profit organizations Donation certificates	Transfer of funds Wallet balances
Power consumption monitoring	Utility companies Governance entities Industry partners (Sensor manufacturers, hardware providers) Regulators and legal experts	Energy consumption data Transaction records Energy payments Smart contracts	Payment transactions User profiles and preferen Legal agreements
SC carbon consumption calculation	Power grid providers Environmental organizations/ projects Certification and verification bodies Smart contract auditors	Consumption data Carbon emission data Proof of sustainability Verification and certification data	Peer-to-peer energy tradir Smart grid monitoring and communication devices Oracles providing real-wor smart contracts
Pollution monitoring platform	Sensor operators Customers (individuals/corporates) Environmental organizations/ projects Scientific institutions	Air/water/soil quality data Geographical data Historical and live data	Monitoring sensors and IoT communication devices Oracles providing real-wor smart contracts

	Automation	**Digital Assets**	**Token economies**
a	Certification process Compliance assessment (project/ ecosystem member eligibility, auditor credential) Verification of eligible supply chain data Access rights and roles	NFTs as Certificate Cryptocurrencies and/or stablecoins as payment method for e.g., accessing reports Utility tokens to provide access to certain functionalities (participating in governance process)	Not applicable for this use case (at least in a first concept phase)
	Creation of donation certificates Confirmation of donation receipt by non-profit organizations Confirmation of project allocation to donor Distribution of project reports	Cryptocurrencies NFT's of donation projects NFT's of donation certificates	Not an integrated part of this use case
ces	Energy efficiency recommendations Security mechanisms and access logs Smart contracts handling legal agreements in case of dispute resolution Oracles providing real-world data	Cryptocurrencies/stablecoins – payment Utility tokens – access to features, rewards for power consumption optimization Security tokens – ownership/ investment in energy-related assets/infrastructure	Rewards and incentive mechanism to verify power consumption and reduction initiatives Governance tokens to grant users access to the decision-making process
ng IoT and ld data to	Carbon emission and account calculations Consumption data monitoring Payment and transaction data Reporting and notifications	Cryptocurrencies (stablecoins) Utility tokens to access specific features, services or data Governance tokens to participate in decision-making processes NFTs representing e.g.; environmental certificates	Staking and reward system to encourage users to stake tokens to access premium features
T and ld data to	Quality level alerts Payment and transaction data Reporting and notifications	Cryptocurrencies (stablecoins) Utility tokens to access specific features, services or data Governance tokens to participate in decision-making processes NFTs representing e.g.; quality certificates	Staking and reward system to encourage users to stake tokens to access premium features Rewards for Sensor operators

Limitations in Blockchain Applications

Data Quality and Integrity

Blockchain ensures the immutability of data, but it does not guarantee the initial quality or accuracy of the data entered. Poor data quality can undermine the effectiveness of blockchain applications in sustainability.

Complexity and Usability

The complexity of blockchain technology can be a barrier to adoption. Users and stakeholders in sustainability projects may require training and support to effectively use blockchain-based systems.

Cost Implications

While blockchain can reduce certain costs, the initial investment in technology development and infrastructure can be high. This may be a deterrent, especially for small-scale sustainability projects or organizations with limited budgets.

Overcoming These Challenges

To overcome these challenges, ongoing research and development in blockchain technology are essential. Collaboration between technologists, sustainability experts, and policymakers can lead to the development of more scalable, energy-efficient, and interoperable blockchain solutions. Additionally, educational initiatives and user-friendly interfaces can enhance the accessibility and usability of blockchain-based sustainability solutions.

Internet Computer as a Sustainable Development Network

The Internet Computer, conceptualized and developed primarily by the DFINITY Foundation, represents a revolutionary leap in blockchain technology. The Internet Computer emerged as a response to the limitations of traditional blockchain and cloud computing platforms, aiming to redefine how we build and interact with decentralized applications and services.

At its core, the Internet Computer extends the functionality of the internet from a network that connects billions of devices to a public computing platform. This ambitious project was developed with the vision of creating a decentralized internet, where software and internet services can run directly on the blockchain, without the need for traditional servers and commercial cloud services.

Key Features of the Internet Computer

Speed

The Internet Computer achieves transaction finality at web speed, far surpassing most traditional blockchains. This is crucial for applications that require real-time data processing and interaction.

Security

The decentralized nature of the Internet Computer, combined with advanced cryptographic protocols, provides robust security against attacks. This security is critical for applications handling sensitive data and financial transactions.

Scalability

Unlike typical blockchain networks that struggle with scalability issues, the Internet Computer is designed to scale seamlessly. Its protocol allows an unlimited number of canisters to operate simultaneously, accommodating a high volume of transactions and operations.

Decentralized Structure

The Internet Computer operates a globally distributed network of independent data centers. This decentralization ensures no single point of failure and a higher degree of censorship resistance.

Sustainability

The efficiency of the Internet Computer reduces the energy consumption typically associated with blockchain computations, making it the most sustainable option in the blockchain space.

By integrating these key features, the Internet Computer not only offers a platform for creating decentralized applications, but also proposes a new structure for the internet itself. It represents a significant stride towards a fully decentralized digital ecosystem, where applications are not controlled by centralized entities, but rather governed and operated in a truly open and democratic digital space.

The Internet Computer's Role in Sustainable Development

'At its core, the Internet Computer extends the functionality of the internet from a network that connects billions of devices to a public computing platform.'

Alignment with Sustainable Development Goals

The Internet Computer's architecture and operational philosophy align closely with several SDGs, particularly those focused on innovation, industry, and sustainable communities.

SDG 9

Industry, Innovation, and Infrastructure

The Internet Computer contributes to building resilient infrastructure, promoting inclusive and sustainable industrialization, and fostering innovation. By providing a decentralized computing platform, it encourages the development of sustainable, scalable, and economically viable digital solutions.

SDG 11

Sustainable Cities and Communities

Through its decentralized nature, the Internet Computer supports the development of sustainable and smart community solutions. It enables the creation of decentralized applications that can improve urban services, from energy distribution to waste management, enhancing the sustainability of cities.

SDG 12

Responsible Consumption and Production

The Internet Computer can streamline supply chains by improving transparency and traceability, ensuring responsible consumption and production patterns. Blockchain technology aids in verifying the sustainability claims of products and services, promoting ethical consumerism.

SDG 13

Climate Action

By providing a more energy-efficient alternative to traditional blockchain networks, the Internet Computer contributes to efforts to combat climate change. Its efficiency reduces the overall carbon footprint associated with blockchain operations, aligning with the goal of minimizing environmental impact.

Commitment to Sustainable Tech Practices

The decentralized nature of the Internet Computer is a significant factor in promoting sustainable practices.

Reduced Energy Consumption
Traditional centralized systems, including large data centers, consume vast amounts of energy. The Internet Computer, by distributing its operations across multiple independent nodes, can potentially reduce the energy consumption associated with data processing and storage.

Resilience and Efficiency
Decentralized networks are inherently more resilient to failures and cyberattacks. This resilience ensures that sustainable projects built on the Internet Computer are less prone to the downtime and inefficiencies associated with centralized systems.

Democratization of Access
The Internet Computer democratizes access to computing resources, allowing a broader range of stakeholders to participate in sustainable development initiatives. This inclusivity is crucial for collaborative global efforts to address sustainability challenges.

Facilitating Collaborative Efforts
By providing a platform for trustless collaboration, the Internet Computer enables disparate groups, including NGOs, governments, and private entities, to work together seamlessly. This collaboration is essential for tackling complex sustainability issues that span borders and sectors.

Advantages of Using the Internet Computer for Sustainability Projects

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‘The Internet Computer‘s architecture and operational philosophy align closely with several United Nations Sustainable Development Goals (SDGs), particularly those focused on innovation, industry, and sustainable communities.’

Aisling Connolly, Senior Research Scientist

Efficiency and Reduced Environmental Impact

The Internet Computer stands out for its efficiency, a feature that significantly reduces its environmental footprint, particularly when compared to traditional blockchain networks. This efficiency is multifaceted:

Energy Consumption

Traditional blockchain networks, especially those using PoW consensus mechanisms, are notorious for their high energy consumption. The Internet Computer, however, uses a more energy-efficient consensus mechanism. This not only minimizes its carbon footprint but also aligns it with global efforts to reduce energy consumption in digital technologies.

Optimized Processing

The Internet Computer's advanced data processing capabilities ensure that operations are executed more efficiently than on other blockchains. This efficiency means that for every unit of energy consumed, the Internet Computer can perform more computations, making it a greener alternative for building and running decentralized applications.

Sustainable Infrastructure

The decentralized nature of the Internet Computer, coupled with its efficient consensus mechanism, allows for a more sustainable and environmentally friendly infrastructure. By distributing the computational load across a network of nodes, it avoids the concentrated energy use characteristic of large data centers.

Scalability for Sustainability Projects

Scalability is a critical advantage of the Internet Computer, particularly for large-scale sustainability projects that require extensive computational resources:

Handling Large Volumes of Data
Sustainability projects, such as those involving environmental monitoring or supply chain management, often require the processing of vast amounts of data. The Internet Computer's ability to handle such large-scale data requirements efficiently makes it an ideal platform for these projects..

Support for Complex Operations
Some sustainability projects involve complex operations and algorithms. The Internet Computer is well-equipped to support these complexities, providing the necessary computational power to run sophisticated models and analyses integral to sustainability research and initiatives.

Adaptability to Growing Needs
As sustainability initiatives expand and evolve, the underlying technology needs to be able to scale accordingly. The Internet Computer's architecture allows for seamless scalability, ensuring that, as the demands of a project grow, the platform can accommodate this growth without compromising performance.

Cost Effectiveness

The cost effectiveness of the Internet Computer is particularly beneficial for startups and NGOs in the sustainability sector because of:

Lower Operational Costs

The Internet Computer's efficient consensus mechanism and reduced need for massive computational power translate to lower operational costs. This is crucial for startups and NGOs, which often operate with limited budgets.

Accessibility and Inclusivity

The cost-effectiveness of the Internet Computer democratizes access to advanced blockchain technology. Smaller organizations and startups, which are often at the forefront of innovative sustainability solutions, can leverage this technology without the financial burden that typically comes with high-end IT resources.

Reduced Infrastructure Investment

By using the Internet Computer, organizations can avoid the high costs associated with setting up and maintaining traditional IT infrastructure. This includes savings on hardware, energy, and maintenance.

Funding and Grants

The alignment of the Internet Computer with sustainability goals also opens opportunities for organizations to secure funding and grants, particularly those aimed at supporting environmentally friendly technologies.

Future Outlook

As we look toward the horizon, the potential for blockchain networks like the Internet Computer to revolutionize sustainable development is both vast and inspiring. The following speculations paint a picture of what the future might hold:

Advanced Scalability and Efficiency

Continuous advancements in blockchain technologies could lead to even greater scalability and efficiency. This evolution would be pivotal in managing larger, more complex sustainability projects, enabling real-time processing of environmental data on a global scale.

Enhanced Interoperability with Other Systems

Future developments may focus on enhancing the interoperability of the Internet Computer with other blockchain platforms and traditional digital infrastructures. This would facilitate a more integrated approach to sustainability, where different systems work in synergy for greater impact.

AI and IoT Integration

The integration of AI and IoT can amplify the Internet Computer's role in sustainability. AI could provide advanced analytics for environmental data, while IoT devices can offer real-time monitoring capabilities, all secured and streamlined by the Internet Computer.

Decentralized Autonomous Organizations for Sustainability

The future might see the rise of decentralized autonomous organizations (DAOs) focused on sustainability initiatives, operated and governed through the Internet Computer. These organizations could democratize decision-making in environmental projects, involving a broader community in key decisions.

Carbon-Neutral or Negative Blockchain Operations

As environmental concerns become increasingly paramount, we may witness the Internet Computer taking strides towards becoming carbon-neutral or even carbon-negative, setting a new standard in sustainable blockchain technology.

Call to Action for Developers and Sustainability Experts

The transformative potential of blockchains in the realm of sustainable development is a clarion call to developers, technologists, and sustainability experts to:

Embrace the Potential
Developers and innovators are encouraged to explore the capabilities of blockchains for addressing sustainability challenges. Blockchain's unique features offer a fertile ground for developing groundbreaking solutions.

Promote Collaborative Innovation
There is a need for cross-disciplinary collaboration, bringing together tech experts, environmental scientists, policymakers, and businesses. Such collaboration can lead to more holistic and impactful sustainability solutions.

Educate and Advocate
Education and advocacy are vital in promoting the adoption of blockchain technology in sustainability. Sharing knowledge, success stories, and best practices can inspire more organizations to adopt these technologies.

Pilot Projects and Case Studies
Implementing pilot projects and documenting case studies can demonstrate the practical benefits and real-world impact of using blockchains in sustainability, encouraging wider adoption.

Policy Engagement
Engaging with policymakers to inform them about the benefits and potential of blockchain in sustainability can help in shaping supportive regulatory frameworks.

The future of blockchains in sustainable development is not just promising; it's a beacon of hope and innovation. By harnessing blockchain's potential, we can embark on a path toward a more sustainable, equitable, and environmentally conscious world. The journey ahead is one of exploration, collaboration, and transformative action.

Conclusion

As we conclude this comprehensive exploration of blockchain's role in sustainability, several key points crystallize, underscoring the transformative potential of this technology in shaping a more sustainable world.

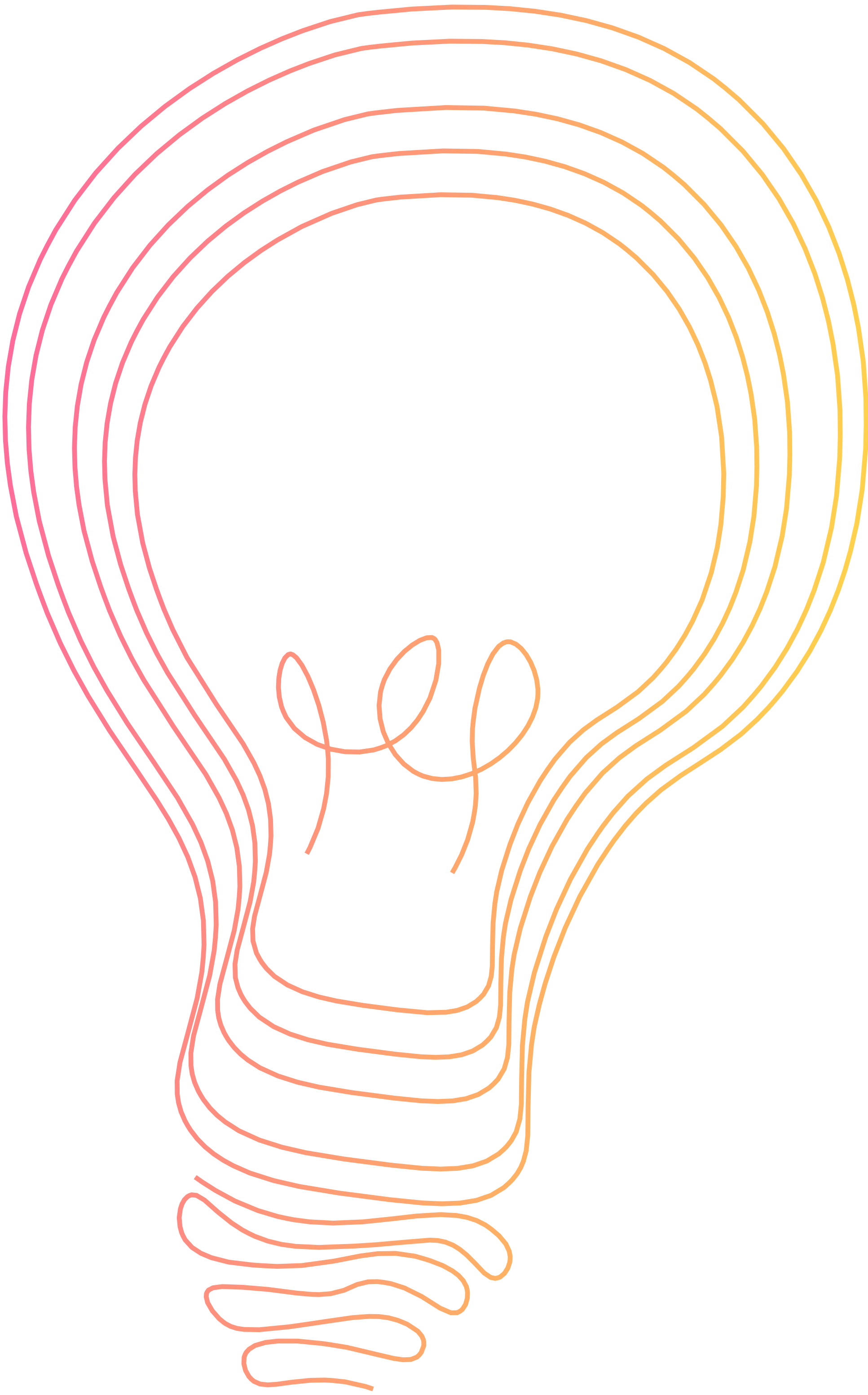
1. **The Power of Blockchain in Sustainability**
   From financing sustainable ventures to enabling transparent marketplaces, certifying eco-friendly practices, and enhancing environmental monitoring, blockchain's versatility is evident via its unique features - decentralization, transparency, security, and efficiency.

2. **Emerging Trends and Applications**
   The exploration of various use cases across different sectors has demonstrated the practical applications and benefits of blockchain in sustainability. These cases highlight not only the environmental impact but also the economic viability, showcasing blockchain as a catalyst for both ecological conservation and sustainable business practices.

3. **Collaboration and Innovation as Key Drivers**
   This journey through blockchain's applications in sustainability underscores the importance of collaborative efforts and innovative thinking. The fruitful partnership between organizations like DFINITY and Inacta Ventures exemplifies the synergy that can be achieved when technical expertise meets industry knowledge. Such collaborations are essential to unlock the full potential of blockchain technology in addressing global sustainability challenges.

4. **Overcoming Challenges for Greater Impact**
   While acknowledging the challenges and limitations of blockchain, including technological barriers and regulatory uncertainties, this report also points towards the future. It calls for continued research, development, and policy advocacy to address these challenges and advance the application of blockchain in sustainable development.

5. **A Call to Action**
   We conclude with a call to action for all stakeholders - developers, businesses, policymakers, and sustainability experts. There is a collective responsibility to leverage this technology for the greater good, to innovate responsibly, and to work towards creating a more sustainable and equitable world.



In summary, blockchain technology is not just a digital innovation; it is a key enabler of sustainable practices and a driver of change in our global efforts to protect and nurture our planet. As we move forward, the importance of embracing and advancing this technology in the realm of sustainability cannot be overstated. It is through continued collaboration, innovation, and commitment that we can harness the full potential of blockchain to create a sustainable future for all.

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'Blockchain technology is not just a digital innovation; it is a key enabler of sustainable practices and a driver of change in our global efforts to protect and nurture our planet. As we move forward, the importance of embracing and advancing this technology in the realm of sustainability cannot be overstated. It is through continued collaboration, innovation, and commitment that we can harness the full potential of blockchain to create a sustainable future for all.'

Aisling Connolly, Senior Research Scientist

INACTA.
VENTURES

About Inacta Ventures

Unlocking the Web3 potential

Driven by the Silicon Valley ethos, we unlock the potential of Web3, providing resources and expertise to thrive in the digital revolution. Our core mission supports both startups and corporations through three pillars:

- Ecosystem Development
- Venture Building
- Capital Activation

We leverage Crypto Valley and Crypto Oasis, bridging two vibrant ecosystems to provide unparalleled access to networks and expertise. Our commitment is to empower, build, and invest in the Web3 domain, facilitating a transformative journey for innovative ideas to become scalable realities.

DFINITY

About the DFINITY Foundation

The DFINITY Foundation is a Swiss-based not-for-profit organization with the largest R&D team in blockchain.

The DFINITY Foundation is a major contributor to the Internet Computer blockchain and its ecosystem. The Internet Computer is powered by novel "chain-key cryptography", which allows it to run at web speed with efficiency, its smart contracts to serve web directly to end users, and its on-chain compute to scale without bound. With these capabilities, mass market Web3 services can run entirely on-chain, opening up the possibility for blockchain to become an alternative to traditional IT. The Internet Computer is governed and updated by the Network Nervous System (NNS), a protocol-integrated DAO. The DFINITY Foundation is made up of more than 200 world-renowned scientists and engineers specializing in cryptography, distributed systems, execution environments, programming languages and more.