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**Short communication**

# Adopting blockchain technology for enhanced collaboration in biodiversity conservation: The CONSCIOUS framework

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## Abstract

The growing environmental challenges, including biodiversity loss, necessitate new tools to enhance collaboration and transparency in conservation efforts. This study introduces the CONSCIOUS framework, a platform built on blockchain technology. The framework's potential to revolutionize communication and cooperation between individuals, organizations, and communities is immense. By leveraging blockchain's ability to create secure and transparent records, the framework ensures clear tracking of project progress and funding. The study demonstrates how this approach can significantly improve stakeholder participation, resource management transparency, and project outcomes accountability. The results suggest that the CONSCIOUS framework has the potential to not just strengthen, but transform biodiversity conservation efforts by uniting diverse groups more transparently and efficiently.

**Keywords**: biodiversity, decentralization, sustainability, open-source, collaborative

## Introduction

The increasing demand for Earth's resources has led to environmental issues such as climate shifts and biodiversity loss. Addressing these issues requires a coordinated and transparent approach. Comprehensive efforts have been made by national and international institutions and organizations to serve this purpose (e.g., TUBITAK 2024, RUFFORD 2024). However, the need for a unified

platform that enhances cooperation and accountability has not been fully met. This need is crucial in the fight against biodiversity loss. On the other hand, there is a preliminary attempt to use blockchain in biodiversity conservation (Chalkias et al., 2024), which provides a baseline for the range of skills blockchain technology can offer. Yadav et al. (2024) and references therein proposed an alternative approach to using blockchain in environmental sciences, particularly for data management and monitoring. However, it remains challenging to involve a wide range of people, including individuals, communities, and organizations, in these efforts.

Blockchain technology has been applied to various aspects of science and scientific data management. For example, the Earth Bank of Codes aims to conserve biological and biomimetic origins and assets by registering them on a blockchain system (Schmidlehner, 2020). Another notable project, Ocean Protocol, provides a decentralized data store and marketplace, enabling stakeholders to share and retrieve data for conservation purposes (OPF, 2024). Several initiatives have also explored the use of blockchain technology in biodiversity conservation (UNEP FI, 2021, and references therein). However, these initiatives often prioritize financial dynamics rather than focusing on trends, interactions, and outputs within biodiversity projects.

This study aims to develop and present an alternative framework that enables individuals, communities, and organizations who may have struggled to contribute effectively to existing biodiversity conservation efforts to play a meaningful role. This paper introduces CONSCIOUS (Collaborative, Open-source Network for Sustainable Conservation and Integrated Universal Solutions), a decentralized platform built on blockchain technology. CONSCIOUS enhances collaboration, transparency, and accountability in environmental initiatives. Unlike current frameworks, it provides a unified platform that allows diverse stakeholders to engage in biodiversity conservation with greater transparency, security, and efficiency.

## Material and methods

The CONSCIOUS platform offers a decentralized solution that improves transparency, accountability, and collaboration by integrating blockchain technology into environmental protection projects. This section explains how to integrate blockchain mechanisms with traditional environmental protection workflows. The CONSCIOUS framework follows a general flow used in environmental conservation efforts:

Project Identification and Planning: Researchers and organizations identify and plan environmental projects.

*Resource Collection:* Fundraising is conducted, and contributions from donors are gathered.

*Project Implementation and Monitoring:* Projects are executed and continuously monitored for progress.

Blockchain technology enhances each stage by providing:

*Transparency and Accountability:* A decentralized ledger records all project-related transactions, including donations, budget allocations, and project milestones, ensuring stakeholders can access real-time updates.

*Secure Data Management:* Project data, including financial records and field reports, is stored on the blockchain to prevent unauthorized alterations and guarantee data accuracy.

*NFT Integration:* Through the Synergy NFT (Non Fungible Token) Platform, artists and researchers can mint NFTs that reflect conservation themes. These digital assets are traded to raise funds for specific projects, and smart contracts ensure the automatic and transparent allocation of funds.

*Ideas Incubator:* This space encourages stakeholders to propose and develop innovative ideas for wildlife and climate conservation. Blockchain-based voting ensures transparency in decision-making, with the community supporting project incubation and development.

## Results and Discussion

CONSCIOUS has been identified and proposed as a decentralized platform that facilitates collaboration, transparency, and accountability in environmental projects. Leveraging blockchain technology creates a secure ecosystem where individuals, communities, and organizations can contribute to projects and track progress.

**Key Features of CONSCIOUS:**

*Project Pool:* This pool brings together researchers, organizations, and donors to collaborate on conservation and climate action projects (Fig. 1).

*Transparency:* Ensures transparency and accountability in fundraising and project implementation *processes.*

*Synergy NFT Platform: Offers* artists and researchers the opportunity to create NFT projects that support conservation efforts (Fig. 2).

*Ideas Incubator:* Provides a collaborative space for developing innovative ideas in wildlife and climate action.

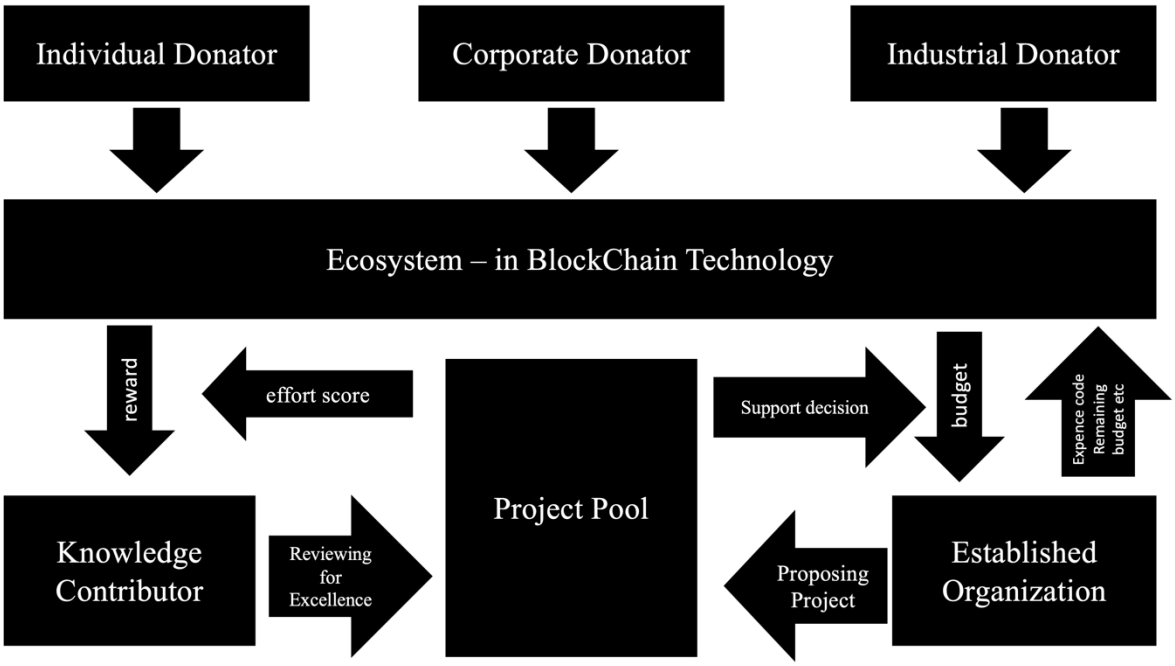


**Figure 1.** Framework for the project pool.

**Benefits of CONSCIOUS:**

*Increased Transparency and Accountability:* Blockchain technology ensures transparency of all transactions and project activities, building stakeholder trust.

*Empowerment of Individuals and Communities:* Provides the opportunity to contribute to environmental initiatives and make a tangible impact directly.

*Enhanced Collaboration:* Promotes effective collaboration among researchers, organizations, and donors.

*Directing Technology for Good:* Demonstrates how blockchain technology can be used to address urgent environmental issues.

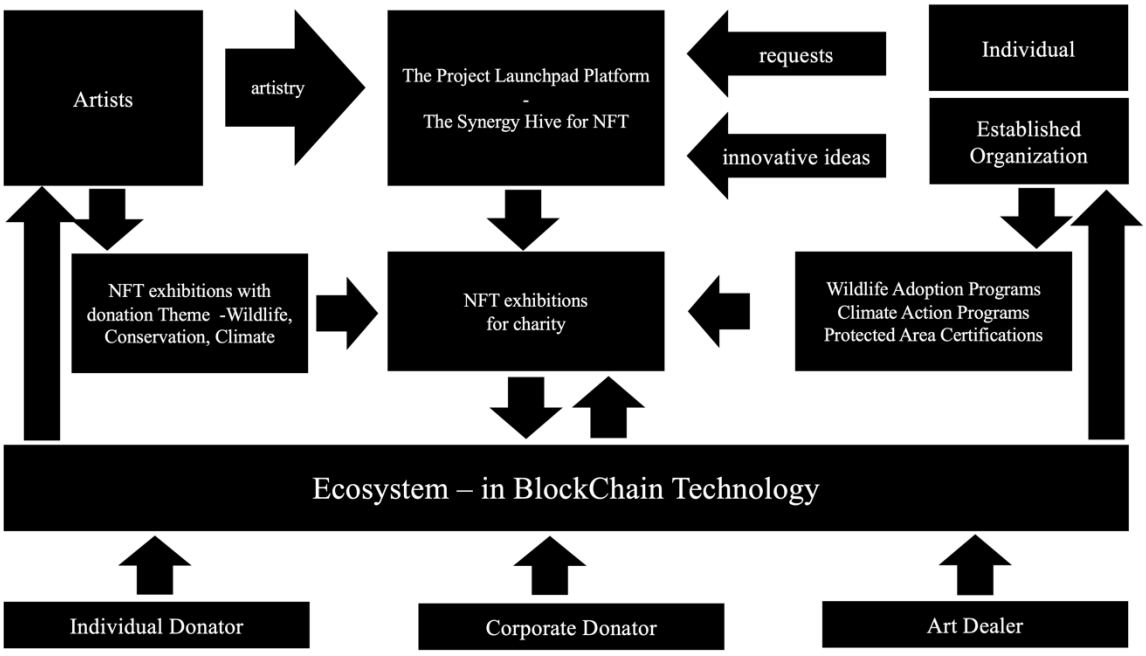


**Figure 2.** Framework for the Synergy hive for NFT.

Dismissing the strengths of the existing system can be harmful. Instead, it should be advocated to build upon these existing foundations by adding critical elements like financial stability and collaboration. This complementary approach, where individuals, communities, and institutions work together and coordinate, can open the doors to a future where human and environmental health evolve in harmony. Bridging the gap between organizations and the decentralized finance world holds great potential. A future where traditional fundraising efforts seamlessly integrate with innovative blockchain-based platforms is inevitable. This approach not only reaches new donor communities attracted by transparency and direct impact but also strengthens existing centralized structures with alternative, transparent funding streams. Utilizing the strengths of both worlds, this hybrid approach creates a strong synergy for a sustainable future. A robust organizational campaign supported by globally conscious individuals and empowered by the latest financial tools can serve as an example. This integrated environment also empowers individual voices. By

overcoming traditional barriers and connecting directly with communities through decentralized platforms, enthusiastic conservationists and dedicated scientists can engage directly with the community with ground-breaking ideas and effective projects. They can now share their vision, request direct support through blockchain-based systems, and receive valuable feedback from engaged citizens without relying on opaque funding mechanisms. Communities become active participants, assessing project contributions, suggesting revisions, and observing progress in real time through transparent budget tracking. This strong, direct connection fosters innovation, accountability, and a shared sense of stewardship for the planet.

To illustrate the potential effectiveness of the CONSCIOUS platform, consider a hypothetical scenario, that a decentralized network of community-led conservation projects that easily connects with donors, researchers, and other stakeholders through CONSCIOUS. The platform's transparency in fundraising and project implementation would build trust, attracting increased support from diverse groups. Additionally, CONSCIOUS could lead to more efficient and impactful conservation efforts. For instance, in a three-year biodiversity project, blockchain's real-time tracking could quickly indicate any issues with fund allocation or project delays, allowing for immediate interventions and significantly improving outcomes compared to traditional oversight systems.

While the CONSCIOUS platform offers promising solutions, several challenges and limitations of blockchain technology must be addressed. One concern is the energy consumption of blockchain networks. However, progress in technology like proof-of-stake and other energy-efficient consensus is close to mitigating this issue. Scalability is another limitation, as larger conservation projects with numerous stakeholders may lead to network congestion, slowing transaction speeds, and increasing costs. To overcome these, solutions like layer-2 scaling can be adapted to the system to manage large-scale environmental initiatives efficiently.

## Conclusion

The CONSCIOUS platform offers a decentralized solution to pressing environmental challenges by promoting collaboration, transparency, and accountability through blockchain technology. It addresses key issues like uniting diverse stakeholders and ensuring project accountability, with features such as the Project Pool and Synergy NFT Platform fostering efficient resource mobilization and innovation. While the framework shows great potential, future efforts should

focus on real-world pilot projects and collaborations to test scalability and address blockchain's energy consumption and scalability challenges for broader implementation.

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