

INTERSPECIES MONEY

Giving Nature Economic Agency

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ABSTRACT

This paper outlines the results of the first pilot of ‘interspecies money’, a new framework that enables digital representations of nonhuman species to participate directly in the market economy.

Grounded in artificial intelligence, financial technologies, and ecological science, interspecies money was implemented through a prototype software platform, Tehanu, in Rwanda’s Volcanoes National Park with the Kwitonda group of mountain gorillas (*Gorilla beringei beringei*)

Using facial recognition, blockchain-linked wallets, and AI-inferred gorilla interests, the gorilla group, through individualised digital proxies, was able to fund conservation tasks aligned with their well-being, ranging from habitat restoration to veterinary care.



The prototype platform, which enabled these exchanges, challenges traditional conservation paradigms by seeking to shift nonhuman life from passive recipients of financial charity to active economic agents. The pilot demonstrated the feasibility of assigning digital identities to other species, inferring their ecological priorities through expert-informed AI models, and executing payments via mobile money.

Although modest in scale, the pilot opens up possibilities for responsive financial networks in which nonhuman species can pursue their interests through small, verifiable financial transfers—reshaping human-nature coexistence, if sufficient financial flows were to follow this approach.



INTRODUCTION

While over six billion bank accounts exist in the world, virtually none are held by nonhuman species.¹ That artificial intelligences may soon be able to spend money according to their programmed interests², while most biological intelligences cannot, is a systemic failure of human imagination. This paper proposes a corrective: a system allowing nonhuman species and ecosystems to participate directly in the market economy.

Consider a framework in which a gorilla—or any other nonhuman species—directs payments for services that support its well-being. Instead of being a passive recipient, the gorilla directs funds to humans providing security, veterinary care, and habitat restoration essential for its survival. The go-

1 GSMA (2025) Welcome to GSMA Mobile Money Metrics. <https://www.worldbank.org/en/publication/globalindex>; World Bank (2025). About the Global Findex 2025. <https://www.gsma.com/mobile-money-metrics/>

2 WEF (2024). How Agentvic AI will transform financial services with autonomy, efficiency and inclusion. <https://www.weforum.org/stories/2024/12/agentvic-ai-financial-services-autonomy-efficiency-and-inclusion/>



rilla may also compensate its human neighbours for improved cohabitation and information creation.

This anticipated circular flow of finance and ecological knowledge is termed “interspecies money”.³ In this pilot, the flow was unidirectional: from digital proxies representing nonhuman species to human service providers. Its aim is to advance equity by rewarding the protection—rather than the exploitation—of biodiversity, addressing the fundamental market failure to correctly value nature’s services.

By linking positive ecological outcomes to financial incentives, interspecies money is designed to benefit both ecosystems and associated local human communities, including Indigenous peoples. Funds flow in real time from species to humans, for services that sustain both parties. Whilst we recognise that a significant shift within the financial sector would be necessary for a large-scale adoption of such exchange, we nonetheless see an opportunity to reimagine structural limitations in existing conservation finance models.

3 Ledgard, J. (2023). Interspecies Money: A New Digital Economy for Nature. Brookings Institution. <https://www.brookings.edu/articles/interspecies-money-a-new-digital-economy-for-nature/>

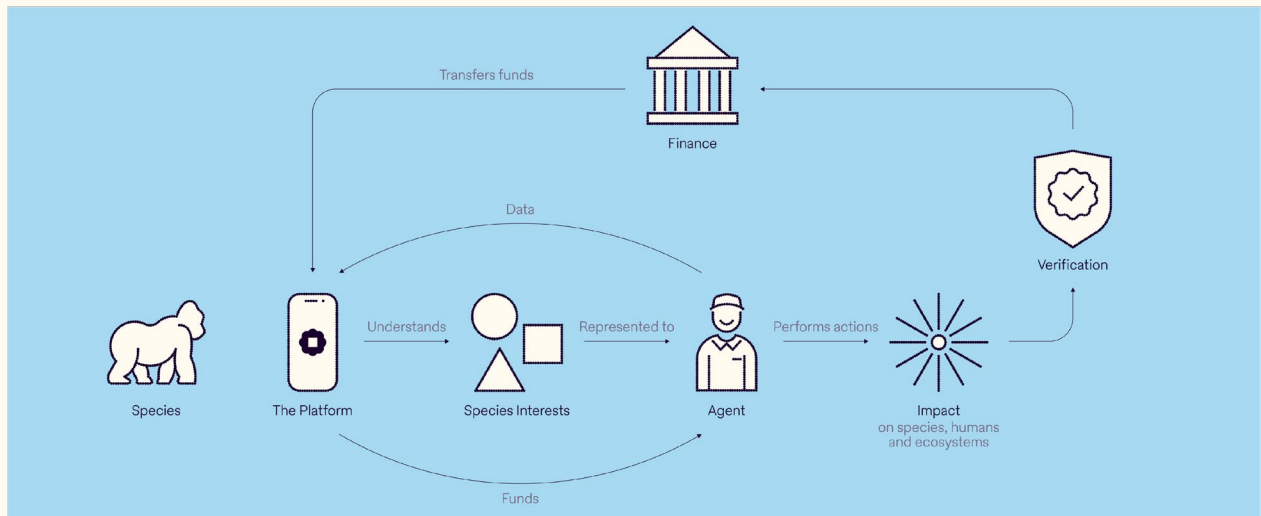


Fig.1 The Tehanu ecosystem. Tehanu is an AI-enabled digital aggregator platform, connecting biodiversity funders to agents that are willing to serve as custodians of nature. Tehanu will also act as a marketplace for value exchange between species.

In 2024, this idea was tested in the Volcanoes National Park in Rwanda with a group of mountain gorillas (*Gorilla beringei beringei*). Tehanu was built as the first operational platform for interspecies money. The Kwitonda group of Rwandan mountain gorillas became the first nonhuman participants in a new economic system—albeit unknowingly. Using biometric identification via Know Your Gorilla (KYG), blockchain-linked wallets, and AI modelling, their digital proxies were able to make mobile money payments in line with interests that would support the well-being of the real-world gorillas.

This approach challenges the longstanding framing of nature as a passive recipient of human goodwill or forbearance. Instead, it enables reciprocal participation. Where it makes sense (and often it will not), a species in a given ecosystem, individually or collectively, may be assigned a wallet and



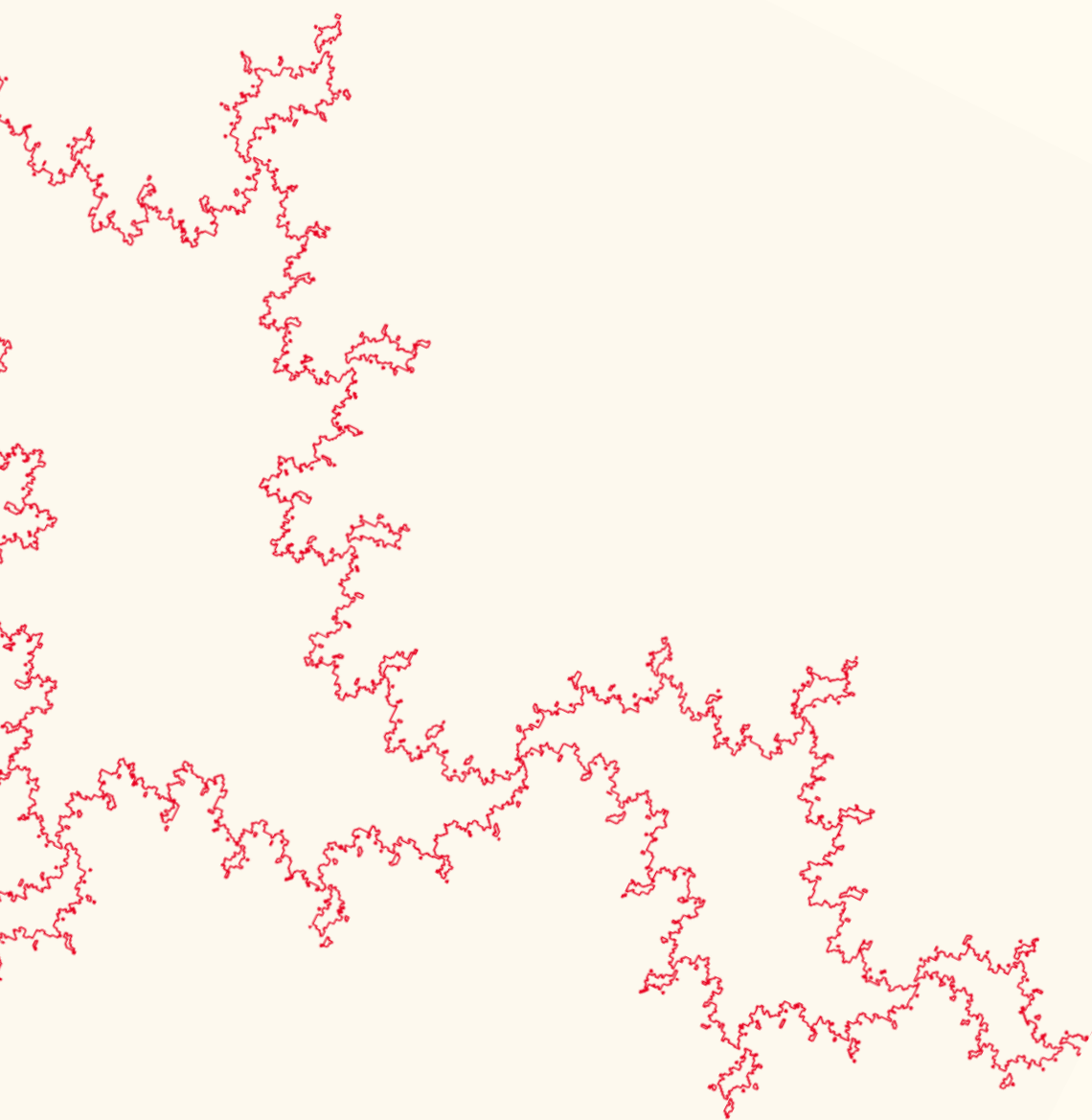
a set of inferred interests, and may fund informational, security, veterinary, and other tasks serving those interests. A wheel is set in motion, one which may turn for decades to come, offering improved care to species in fragmented and warming ecosystems.

The pilot demonstrated three key proofs of concept. First, that a nonhuman species can be assigned a unique digital identity and associated wallet. Second, that AI can infer reasonable species-level interests from available data. Third, that payments can be made from species-linked digital wallets to humans, via a mobile money network, with transactions transparently recorded on a blockchain ledger.



Image 1: Sulubika holding her daughter Gisubizo (“Solution”), Kwitonda group.

This paper sets out the architecture, methods, and outcomes of the pilot. We hope to scale the Tehanu platform to many other species and ecosystems, enabling non-human life to access representation and resources in a shared economic system—an experiment in interspecies economy where more-than-human contributions are acknowledged.





METHODS

The Tehanu platform facilitated interspecies money exchange between gorillas and humans in Rwanda. It was designed to support a circular flow of funds and ecological data between nonhuman species and designated human actors. Its core components include:



Digital Identity – Know Your Gorilla (KYG)

Each individual gorilla was assigned a unique digital identity using biometric recognition adapted from Know Your Client (KYC) protocols in financial systems.⁴ The KYG system focused primarily on confirming the identities of individual gorillas' through facial recognition, drawing on long-term observational data collected by rangers and researchers to recognise individuals by their unique

4 Know Your Client (KYC) is a regulatory process used by financial institutions and other regulated entities to verify the identity of their clients. It helps prevent financial crimes like money laundering and ensures compliance with legal and ethical standards. KYC typically involves collecting personal identification, understanding the client's financial background, and monitoring for suspicious activity.



set of nose wrinkles, known as the “nose-prints”. Substantial visual datasets were collated from multiple sources. A library of photographs was provided by the Rwanda Development Board, the Dian Fossey Gorilla Fund, and Dr. Martha M. Robbins. Additional images of related lowland gorillas were added from Bristol Zoo. To support continuous image acquisition, 73 motion-activated camera traps were installed in the Kwitonda group range of the Volcanoes National Park. Approximately 2200 camera-trap images were manually annotated to improve detection performance and evaluation metrics.

The cameras used were Browning Recon Force Elite HP5s. These units are motion-activated, high-resolution devices with weather-resistant casings designed to withstand Virunga’s challenging environmental conditions, including high humidity and frequent heavy rain showers. Regular maintenance was essential to ensure uninterrupted data collection. Site visits were conducted bimonthly to retrieve footage, replace SD cards, and verify the operational status of the cameras. During these visits, batteries were replaced, lenses cleaned, and cameras repositioned as required.

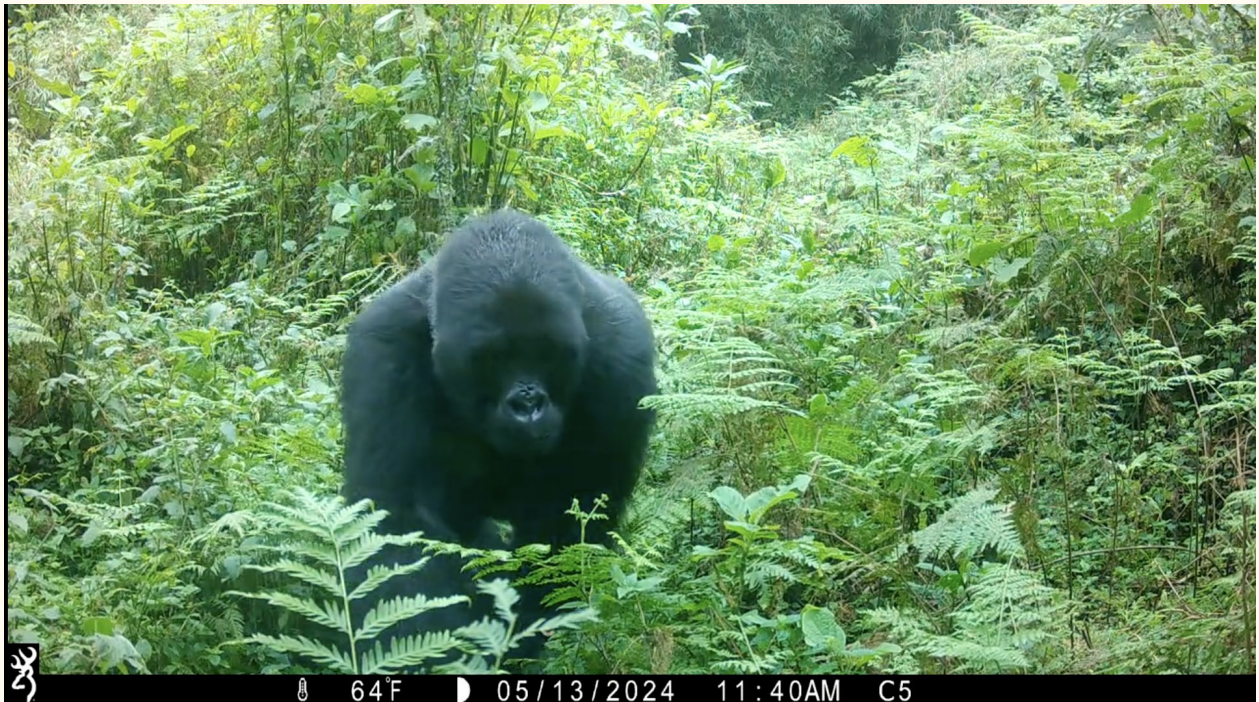


Image 2: An example image of a passing gorilla collected by a camera-trap labeled C5. The unique set of nose wrinkles is visible.

Image processing was optimised for two objectives: species detection and identification of individual gorillas based on facial recognition techniques that exploit the unique gorilla nose-print.

The detection pipeline follows a two-stage architecture. First, gorilla face detection was performed using a fine-tuned YOLOv10 model. The model employs augmented negative mining to limit false positives from human faces and improve robustness across diverse environmental conditions, including variable lighting, partial occlusion, and pose variation. Second, the detected facial regions were forwarded into a modified DINOv2 vision transformer, where only the classification head undergoes fine-tuning. This leverages the model's rich self-supervised representations to



extract gorilla-specific feature extraction. This approach transforms the pre-trained features into class-specific predictions optimised for individual gorilla recognition. Each gorilla's name, group affiliation, and familial relationships were recorded on a blockchain registry, establishing a tamper-proof profile. This is the foundation for a wider 'Know Your Species' (KYS) framework for nonhuman life linking into a digital financial system.



AI-assisted Inference of Interests

Because nonhuman species cannot communicate their needs directly to us, an AI model was trained to infer their likely interests: essentially, how might a gorilla choose to legally and sensibly spend money for its own well-being? A custom LLM was trained to analyse approximately 250 peer-reviewed studies on mountain gorilla ecology, health, and socioeconomic dimensions.⁵ These studies were identified through an integrative review of the literature conducted between February and April 2024 by a mountain gorilla conservation practitioner. The review employed focal questions and 25 associated keywords using the search engine Google Scholar, with the identified articles banked in a Zotero library. Common themes such as disease protection, diet, habitat use, and safe-

⁵ Rapid ingestion and structuring of peer-reviewed ecological studies, expert interviews, ranger logs, and telemetry data were enabled by Anthropic Claude and Amazon Bedrock. The system processed and synthesised complex, unstructured information through pipelines built on Amazon S3, Lambda, and CloudWatch.



ty were extracted. Additionally, three decades of data were analysed to identify spatial and temporal patterns. These included GNSS coordinates from gorilla encounters and follows, health logs, daily status checks collected by rangers as digitally transcribed notes and more recently via the CyberTracker platform. These data were used to plot patterns of seasonal movements of the gorillas. The refined LLM generated several hundred distinct mountain gorilla interests, divisible into discrete, fundable actions. From these, a list of ten overarching interests was inferred. In parallel, a qualitative track involving interviews with more than 30 rangers, veterinarians, community members and ape experts was conducted to complement and validate the LLM outputs.



Wallets, Blockchain and Governance

Each individual of the Kwitonda gorilla group was assigned a digital wallet, preloaded with Rwandan francs (RWF) allocated by Rwanda's Ministry of Finance. Integrated within Tehanu's technology ecosystem, the wallet functions as a blockchain-based financial instrument linked to the individual's digital identity. It securely holds and transfers funds earmarked for nature-positive actions, enabling a hierarchical yet flexible structure for on-chain identity and affiliation, and tamper-resistant transactions between funders and human agents. Solana was selected for this architecture due to its low trans-



action costs (currently estimated to average USD 0.05 per action), high throughput capacity, and sub-second finality, which are essential for micro-transaction-heavy ecological financing. These performance characteristics allow the system to scale efficiently as new species, user groups, individuals, and actions are added—without compromising cost-effectiveness or user performance. The system architecture employs Solana’s program-derived address (PDA) authority model, incorporating a hierarchy of sub-accounts representing species, groups, and individuals.

The platform’s wallets and smart contracts represent species, groups, and individuals—providing a framework for identification, encoding of ecological and economic interests, and the creation of an immutable audit trail of both biological and financial interactions. This infrastructure ensures accountability across transactions while laying the foundation for species-directed control of financial resources.

The digital identity for Rwanda mountain gorillas follows KYG procedures. For gorillas, wallets were applicable at the individual level. For other species, wallets may be defined for communities or kinship units, linked to the overarching species digital identity. Any interests or actions—at the species, community, or individual level, or actions regarding their welfare, inferred through a variety of methods (described below) are registered via



the Tehanu app and stored on-chain. As a result, task fulfillment and payments are recorded in the ledger via programmatic attestation, triggering state transitions in the accounts and disbursement logic. These wallets are operated under a delegated governance model in which a human trustee executes payments based on AI-inferred species interests. Because nonhumans cannot yet execute payments, the trustee—typically a primatologist or other domain expert affiliated with Tehanu—interacts with the wallet through secure private key infrastructure using cryptographic credentials, acting only when programmatic conditions are met, for tasks meeting the species’ interests. This architecture allows nonhuman species to participate meaningfully in economic systems through trusted, AI-driven recommendations, representing a novel model for inclusive, ecological finance.



Mobile Money Integration

To enable disbursement to human participants, the Tehanu platform integrates with Rwanda’s MTN MoMo mobile money system via PawaPay, a regulated gateway, and APIs including from the Bank of Kigali. It bridges on-chain transaction intent with off-chain monetary settlement. Once an action is validated, the transaction is logged on-chain, and the associated Rwandan francs (RWF) payment is instantly dispatched via mobile money to the designated human actors, such as rangers, trackers,



vets, or local residents. The transaction receipts are then recorded back on-chain for auditability. This integration enables near-real-time delivery of funds without requiring recipients to hold a bank account. With national mobile money penetration at 87 percent⁶, and many more having indirect access via family members, this ensures accessibility and delivery of funds in RWF.

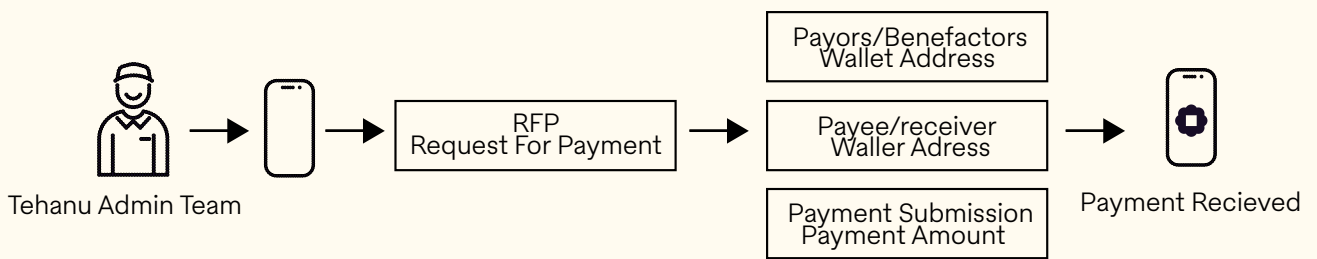


Fig. 2 The Tehanu blockchain-based governance and payment prototype supported by Pawapay and MTN/MoMo

⁶ Rwanda Utilities Regulatory Authority (RURA) (2022). https://rura.rw/fileadmin/Documents/docs/report/Annual_Report_for_2021-2022.pdf



PILOT IMPLEMENTATION

The pilot project—Gorilla 1.0— was conducted in Volcanoes National Park in Rwanda, with formal support from the Government of Rwanda and the park authority. The project preparation included stakeholder engagement, with outreach to the Dian Fossey Gorilla Fund and other gorilla-focused NGOs, local government, the Rwandan Development Board, and in-person sessions with rangers and trackers.

The Kwitonda group (more details in the supplementary material) was selected based on its proximity to the park boundary, group size, and the availability of long-term data monitoring. Rangers and trackers played a central role in the implementation of the pilot. To initialise the KYG system, rangers produced labelled video portraits of individual gorillas, identified through their nose-prints. The rangers also maintained the 73 motion-sen-



son cameras installed by the Tehanu team at gorilla “hotspots” determined by historic Kwitonda movements.

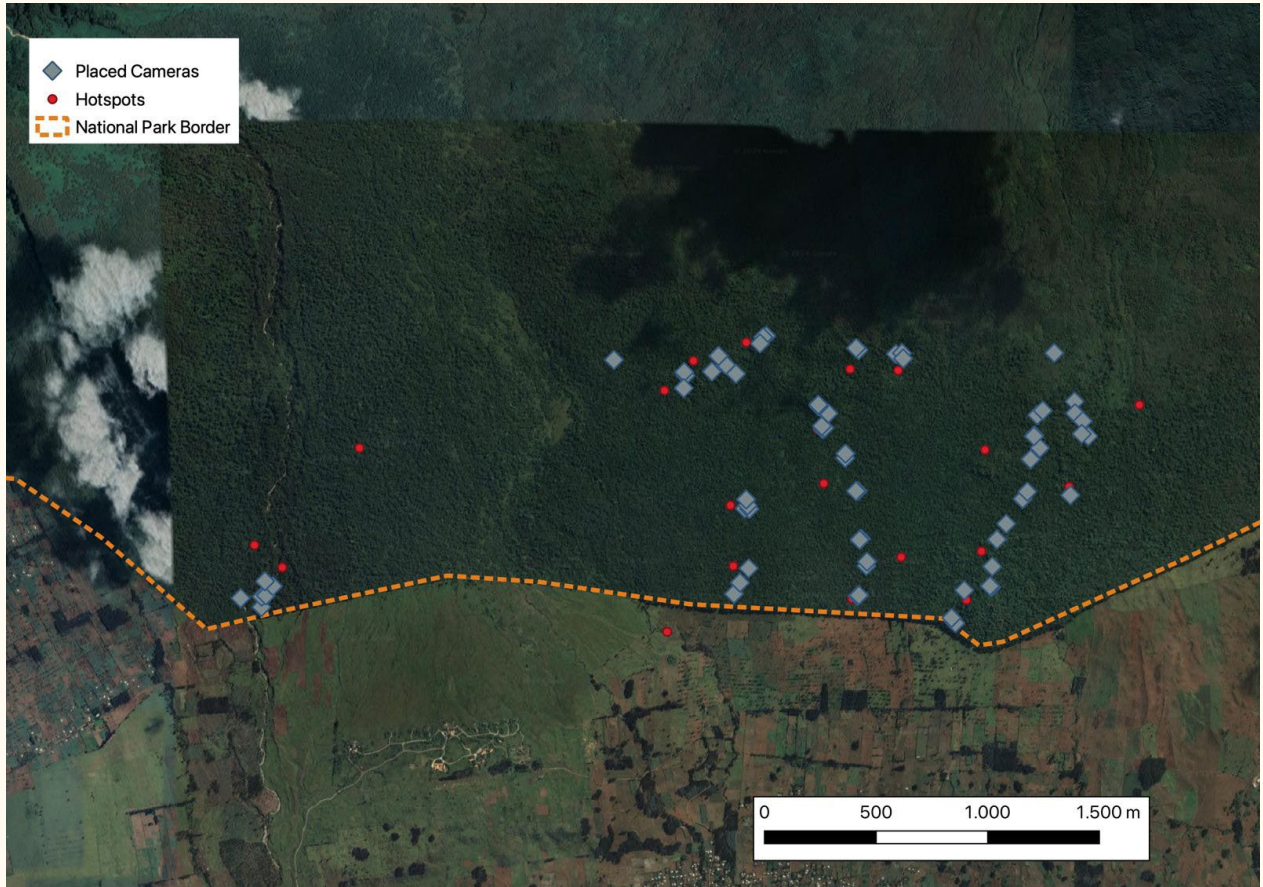


Fig. 3 Gorilla hotspots averaged from 2012–23 gorilla movement tracking (red circles) and camera-trap distribution (blue squares) alongside the VNP Boundary.

To complement the literature and field data collection, 32 interviews were conducted in May 2024, based on a semi-structured questionnaire (see Supplementary Methods). A snowball sampling approach was used to interview trackers, rangers, veterinarians, researchers, porters, local government, cooperative members, and farmers. Interviewees were asked about the needs and interests of gorillas as well as those of people, what people currently do—or could do—to support the



well-being of mountain gorillas, and how payments might best be delivered for incentivising broader participation, and/or more actions supporting gorilla well-being. A deductive, reflective methodology was applied to guide qualitative analysis using NVivo software and interpretation.

The inferred interests of gorillas were assigned corresponding specific conservation tasks: tree planting, path clearance, anti-poaching patrols, and veterinary observation (details available in supplementary methods). Through an engagement process, designated human actors could be recruited to carry out these tasks, with annualised payments benchmarked at one-quarter of Rwanda GDP per capita⁷, following best practices in conservation basic income research.⁸ This price point was calculated to correspond to a monthly payment of USD21, or RWF30,000. Going forward, future iterations of the system may be regulated by simple supply and demand.

⁷ USD 254, or RWF 360,000

⁸ de Lange, E., Sze, J.S., Allan, J. et al. A global conservation basic income to safeguard biodiversity. *Nat Sustain* 6, 1016–1023 (2023). <https://doi.org/10.1038/s41893-023-01115-7>



SYSTEM ARCHITECTURE

At maturity, the proposed architecture should enable nonhuman species to hold and direct capital through digital identity, inferred interests, and programmable payments. This would involve digital proxies of nonhuman species participating directly in the market economy. The Eidolon case study (see Scaling Tehanu section below) provides an example of ecological services linked to micro-payments. Overlooked species—such as insects, smaller vertebrates, and trees—contribute significantly to long-term ecological value. Their inclusion should be prioritised in future versions of the Tehanu system.

The current system is limited to payments triggered by verified tasks. Tehanu may, over time, incorporate agentic AI and smart contracts to support more autonomous representation. Agentic AI might be tasked with representing organisms



in financial systems at the level of species and groups. Given prohibitive complexity and costs, it would only rarely extend to individuals. These agents would be trained on ecological data from multiple sources, interpreted in coordination with human trustees.

Future Directions:

The components below are speculative next steps and depend upon further advances in agentic AI and ecological sensing:

AI agents: Dedicated AI agents may represent species and group-level nonhuman clients. Each model is trained and periodically updated to reflect the ecological status of a group or, in rarer cases, an individual. An agent performs ongoing analysis of ecological knowledge to infer priorities for the client. Images for identity verification may be captured manually via mobile phones or automatically through camera traps and other devices. In the pilot, manual observations often yielded superior results. Agents would also verify the conditions under which payments are triggered.

Digital identity management: A persistent digital identity (KYS), links ecological signals to financial flows. In most cases, identity is bounded at the group, colony, roost, nest, or family level. Occasionally, as with gorillas, it may be for an individual. The agent uses identity to interact with the architecture on the client's behalf. Where individual tracking is not possible, group or species-level identities may be established. This identity facilitates



monitoring and ensures payments are linked to real-time or validated ecological states.

Human interface: Human actors—including field workers and researchers—may interact with AI agents via digital dashboards, complementing in-person observations. The AI agent uses interfaces and dashboards to support status updates, alerts, or task verification. Users may prompt the agent to query basic indicators, such as health status.

Payments and remuneration: The current system supports low-value digital payments to human actors for services—such as habitat restoration or sensor maintenance—aligned with the interests of the nonhuman client. Transactions are recorded via blockchain-linked wallets and may be scheduled or conditional. Remuneration is offered via tokens on blockchain as the primary mechanism for payments. AI agents may initiate token transfers from the digital wallet of the nonhuman client to designated recipients. Tokens can be exchanged for fiat cash at relevant financial institutions supporting the system. Payments may be scheduled or triggered by verified task completion, such as a veterinary visit.

Minting of new tokens and cash conversions: Financial institutions facilitate the conversion of payments between fiat currency and on-chain tokens. For example, for every dollar received from donors, a financial institution can mint the equivalent number of tokens to the blockchain. Similarly, tokens returned by human actors can be burned by financial institutions in exchange for fiat currency.

Token allocation and balancing: Smart contracts may allocate newly minted tokens to nonhuman clients based on parameters such as species type, age, habitat, and human competition.



Although currently outside the system's scope, the blockchain infrastructure could, over time, autonomously mint small amounts of new tokens to address local economic dynamics, such as rising costs or inflation faced by the community. This concept mirrors Bitcoin's protocol, where new tokens are periodically generated and awarded to miners for securing the network.

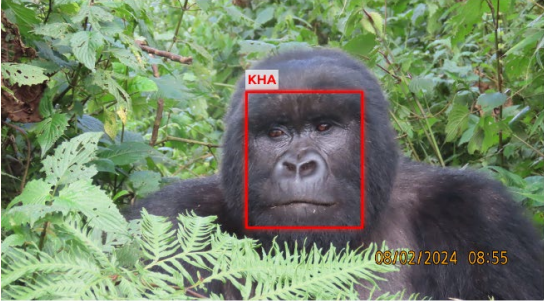
Token issuance could reflect measurable ecological improvements, such as increased numbers or gains in health and security. For instance, as a population of gorillas improves in health and size, the ecosystem value of that group increases. The system could mint new tokens proportionally, representing this enhanced value. These tokens could then be distributed to human actors, recognising the additional responsibilities involved in managing larger and more complex animal groups.



RESULTS

Digital Identities and Facial Recognition

Know Your Gorillas
Volcanoes National Park



RETAKES

Kungahara (KHA)	96% 89%
Age	12
Group	Kwitonda
Sex	Male
Mother	Mugeni
Siblings	Urwego, Ikiye

By the conclusion of the pilot, each gorilla in the Kwitonda group had been assigned a verified digital identity and could be reliably distinguished by the system. The KYG algorithm consistently matched new images to the correct individual with classification accuracy exceeding 93% on Kwitonda portraits with image overlap and 75% on camera-trap images using a DINOv2 vision transformer model with cross-validation. Of the 73 camera-traps installed, 50 successfully captured gorilla imagery. Images of forest elephants, bushbuck, waterbuck, buffalo, serval cats, golden cats, blue monkeys, jackals, francolin, as well as feral dogs



and boars were also recorded and shared. This data was sorted, annotated and shared with the Volcanoes National Park administration. As additional data are collected via crowdsourcing and camera-traps, classification accuracy is expected to improve further. At present, the KYG portal accepts an image input and returns the identified gorilla's name, sex, age, as well as establishing its maternal and sibling relationships. KYG represents a significant advancement in representing the digital identity and economic agency of a gorilla. It paves the way for development of an integrated KYG-Interest-Governance-Mobile Money Payment System.

AI-assisted Inferred Interests and Task Execution

An AI model, refined through expert input and ecological data, generated hundreds of potential interests, of which ten were prioritised. While most AI-inferred interests aligned with existing conservation findings, there were notable divergences. For instance, the model inferred that, if granted agency, a gorilla might allocate interspecies funds towards more frequent veterinary interventions for digestive disorders, which was not reflected in expert interviews. Each interest was mapped to a suite of actionable tasks to improve health, security, and cohabitation. Specific actions were defined based on expert input. Designated human actors, including rangers, trackers, vets, or community teams, were pre-assigned tasks. Since the



prototype presently lacks automated verification component, each action needs to be validated by a human expert. In future iterations, Tehanu payments are expected to be linked to the automated verification of the completion of each pro-nature service.

Interest	Example Action	Actor
Protection from human-transmitted diseases	Implement strict hygiene protocols for tourists, researchers, and staff	Park management, healthcare professionals
Habitat protection and expansion	Remove invasive plant species	Park staff, volunteers
Protection from poaching and human-wildlife conflict	Implement community-based snare removal programs	Local conservation teams
Enhanced health monitoring and veterinary care	Conduct regular, non-invasive health assessments using faecal sampling and visual observations	Wildlife veterinarians, researchers
Sustainable tourism management	Monitor and evaluate the impacts of tourism on gorilla health and behaviour	Researchers, park management
Community engagement and sustainable development	Establish community-based monitoring and conservation initiatives	Conservation organizations, local communities
Climate change adaptation	Conduct ongoing monitoring of climate impacts on gorilla habitat	Researchers, park staff
Maintained social structure and reproductive success	Conduct long-term research on social dynamics and reproductive patterns	Primatologists
Genetic diversity management	Create habitat corridors to allow natural gene flow	Conservation planners, government agencies
Effective transboundary management	Implement joint monitoring and anti-poaching programs	Park authorities from multiple countries

Table 1: AI-generated gorilla interests, together with agents who can act on them, and one example action per interest. A full list of interests is available in supplementary materials.



Human-Inferred Interests: Qualitative Track

In parallel with the LLM inference, 32 qualitative interviews were conducted with a range of individuals (from trackers and ape experts, to farmers and cooperative members) to compare with the AI-inferred interests. Although not recorded on the Tehanu platform, these interviews served to validate the LLM outputs, effectively ‘sense-checking’ inferred interests. The interviews were thematically analysed, revealing high-level interests that broadly mirrored those inferred by the AI model. The table in supplementary materials lists the interests that arose from the interviews, which broadly matched the AI-inferred interest results. The interviews also yielded context and culturally-specific perceptions about interspecies money.

First Interspecies Transactions

In August 2024, Tehanu achieved a key milestone: the execution of the first proof-of-concept transaction from a gorilla’s digital wallet to a human’s. This transaction was initiated in response to a registered interest on the platform, such as the detection of a snare, which triggered a corresponding task for human intervention. Upon task verification, a designated human trustee, such as a conservation expert, used the Tehanu platform to authorise payment. This approval triggered an on-chain transaction, with recorded data translatable as fol-



lows: Gorilla Gisubizo's account Ox941... paid Ranger X's account Ox952... an amount of 5,000 RWF for the task 'snare removal', linked to the registered interest 'Preserve safe movement in habitat', with timestamp and associated metadata. The transaction concluded with a mobile money disbursement via the integrated payment gateway, demonstrating the system's ability to link nonhuman agency with human economic participation through decentralised infrastructure. Though limited in scope, these initial payments demonstrated the platform's functionality and operational efficiency. One can envisage a scaled-up version of this pilot featuring a catalogue of interests, and associated tasks with predetermined prices, in which payments are released from a gorilla's wallet to a human upon task completion.



DISCUSSION

Ethical, Legal and Social Considerations

Scaling the Tehanu platform, and variant forms of interspecies money, will require comprehensive mapping of ethical, legal, social, and cultural landscapes. Ethical frameworks must address foundational questions, such as whether it is reasonable to assume that nonhuman species want financial representation. While philosophers and biologists continue to explore theory of mind in nonhuman species and its implications for human society⁹, we attempt to infer the likely goals, intentions, or knowledge states of nonhuman individuals in order to approximate their interests. Oversight processes should therefore also evaluate the interest inference methodology, which remains provisional until species can directly communicate their needs.

⁹ See for example: Corbey, R., & Lanjouw, A. (Eds.). (2013). *The Politics of Species: Reshaping our Relationships with Other Animals*. Cambridge: Cambridge University Press.



Conflicting ethical claims between species, or between species and humans also require careful evaluation.

Legal and governance frameworks must evolve in parallel to interspecies money. The notion of non-humans holding and directing assets challenges prevailing legal frameworks—though change is underway. Movements such as rights of nature, sovereign nature, interspecies futures, animism, animal liberation, and animal welfare have advanced recognition of nonhuman rights and ecological agency.¹⁰ Legal personhood has already been extended to “natural objects”, including the Whanganui River in New Zealand in 2017¹¹ and Ecuador became the first country to enshrine rights of nature in its Constitution.¹² While Tehanu will work with frontier environmental law and ethics, its success will not entirely depend on legal personhood: intermediary proxies, such as legally-recognised companies or trusts, may act as holders and spenders of funds.

The adoption of Tehanu’s approach requires sustained engagement from individuals, communities, and governing authorities. As with any behaviour change incentive programme, outcomes depend on social dynamics and cultural context.¹³ Advanced deliberation and sound management of

¹⁰ Boyd, D.R. (2017). *The Rights of Nature: A Legal Revolution That Could Save the World*. ECW Press

¹¹ Parliament of New Zealand. (2017). *Te Awa Tupua (Whanganui River Claims Settlement) Act 2017*

¹² Constitution of Ecuador 2008 – Articles 71–74 (Rights of Nature)

¹³ Nilsson, D., Baxter, G., Butler, J.R.A., & McAlpine, C.A. (2016). How do community-based conservation programs in developing countries change human behaviour? A realist synthesis. *Biological Conservation*, 200, 93–103.



participatory processes, property and other rights, local institutions, and contract legitimacy have long been recognised as integral to direct payment schemes.¹⁴ This is also true for interspecies money. While many participants responded positively, others found the idea of nonhuman species paying humans sensitive or contentious. In some settings, it elicited scepticism. In a few cases, there were even expressions of contempt that a gorilla, or trustees authorised to act on its behalf, might be seen as more deserving of a wallet or financial resources than a human. Participants also offered divergent views regarding the rightful recipients of payments—for instance, whether they should go to the individual completing the task, or be allocated to a community-level fund.

Interspecies money will always be required to adapt, not only to the varying priorities of different species, but also to local perceptions of nature, money, work, and ownership—both individual and collective. Transparency, culturally relevant communication, and accessible dispute-resolution processes will be essential for building and maintaining trust. Best practices in social accountability¹⁵ may guide the individuals and organisations involved in the facilitation and governance of interspecies money.¹⁶

14 Milne, S., & Niesten, E. (2009). Direct payments for biodiversity conservation in developing countries: Practical insights for design and implementation. *Oryx*, 43(4), 530–541. <https://doi.org/10.1017/S0030605309990330>

15 One such resource is the Global Partnership for Social Accountability: <https://thegpsa.org/>

16 See Rohwerder, B. (2016). CSOs supporting accountability in cash transfer programmes (K4D Helpdesk Research Report 17). Birmingham, UK: GSDRC, University of Birmingham.



AI: risks and opportunities

AI has the potential to support – and significantly improve – the continuous inference and updating of species’ interests under changing ecological conditions. As AI systems enter increasingly autonomous phases across sectors—from finance to defence—the window for aligning their logic with nonhuman life is closing fast. The pilot offers a model for embedding ecological priorities in digital infrastructure, enabling AI to register and respond to the inferred priorities and needs of biological intelligences. Without inclusion, other species may remain dangerously invisible to AI systems optimised for speed, profit, control, completion, and narrowly human needs. In this light, Tehanu is not merely a conservation mechanism, but a tool for aligning human, machine, and biological intelligences.

Given the open design of interspecies money, safeguards against human manipulation will be essential. Ultimately, interspecies money relies on humans acting on behalf of other species. Robust ethical protocols, quality control and validation, strong community relations, and independent oversight will be required. Research in mechanism design and platform governance indicates that incentive structures must align interests not only to encourage fair participation but also to minimise the risks



of strategic manipulation.¹⁷ As Tehanu scales, emergent risks must be identified early and addressed systematically. The platform must remain secure, resilient, and resistant to manipulation, misconduct, and fraud. Ongoing research is needed to mitigate potential harms, such as exploitation of other species, negative impacts on the environment, and adverse outcomes for participating communities. Robust data governance will remain critical. It must comply with regulations, maximise public benefit, and safeguard sensitive data to uphold privacy and security. The pilot suggests that involving local communities and relevant authorities in co-design might be among the most effective ways to pre-empt and mitigate the risk of conflict. Co-design enhances the platform's adaptive capacity to apply and implement social safeguards.

Scaling Tehanu

The pilot's success indicated clear next steps. Tehanu is species-agnostic: in principle, any species can be assigned a wallet and an ever-improving set of inferred interests. Accordingly, the platform could evolve into a modular, cloud-based service, an 'App Store' for species, with sufficient components for identity (e.g. verified portraits for charismatic species, acoustic signatures for vocal

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17 Abebe, R. & Goldner, K. Mechanism Design for Social Good. *AI Matters* 4, 27–30 (2018). <https://doi.org/10.1145/3284751.3284761>, Arnosti, N., Johari, R. & Kanoria, Y. Managing Congestion in Decentralized Matching Markets. *Oper. Res.* 68, 1025–1040 (2020). <https://www.columbia.edu/~yk2577/congestion.pdf>



species, Global Navigation Satellite System tags for migratory species), AI agents to infer ecological interests, and off-ramps for payments that serve local contexts.

The platform's architecture supports both individual-level wallets for charismatic species, such as gorillas, and collective wallets for poorly protected species, such as the straw-coloured fruit bat (*Eidolon helvum*), a primary seed disperser in the Congo rainforest. Colonies of up to 150,000 *Eidolon* have been shown to disperse more than 300,000 seeds per night, driving carbon sequestration, soil regeneration, and biodiversity recovery at scale. These ecosystem services are conservatively valued at USD 10–100 billion annually, yet the species is classified as Near Threatened, with estimated declines of 25–30% since 2010 due to habitat loss and human disturbance. By bounding *Eidolon* and assigning it wallets and inferred interests at the roost-level, Tehanu could link ecological function to verifiable financial flows. The same framework could be applied to other ecologically critical species.¹⁸

While current and planned deployments remain species-specific, one can envisage future applications of interspecies money operating at the

¹⁸ van Toor, M. L. et al. Linking colony size with ecosystem services of a bat species in an Afrotropical landscape. *Ecol. Evol.* **9**, 11210–11220 (2019); Costanza, R. et al. Changes in the global value of ecosystem services. *Glob. Environ. Change* **26**, 152–158 (2014); Fahr, J. et al. Bats and their ecosystem services in Africa. *African Chiroptera Report* **2015**, 1–15 (2015); Dechmann, D. K. N. & Wikelski, M. Animal social behaviour and ecosystem services: how bats interact with their environment. *Funct. Ecol.* **27**, 865–874 (2013); IUCN. The IUCN Red List of Threatened Species. *Eidolon helvum*. Version 2022–2. <https://www.iucnredlist.org> (2022)



ecosystem level—reflecting a broader shift in conservation science beyond single-species initiatives. Ecosystems, however, are complex networks of interdependent organisms. Future iterations of interspecies money could assign a collective wallet to natural objects such as a forest, or to an entity such as a river or mountain. These may be more readily assigned legal personhood and could be integrated using Know Your Object protocols.¹⁹ As tools for ecological monitoring continue to advance, ecosystem-level optimisation using the Tehanu platform could support tasks like invasive species removal. The platform aims to align ecosystem-level interest inference with other tools performing ecosystem monitoring at scale and especially with emerging ecosystem intactness indices.²⁰ These indices could one day serve as beacons of ecosystem health and provide data to direct interventions in the best ecosystem interest.



Fig. 4 Eidolon plays a critical role in the survival of the Congo Rainforest.

- ¹⁹ Stone, C. D. Should trees have standing?—Toward legal rights for natural objects. *South. Calif. Law Rev.* **45**, 450–501 (1972)
- ²⁰ Watson, J. E. M., Evans, M. C., Carwardine, J., Fuller, R. A., Joseph, L. N., & Possingham, H. P. (2018). The exceptional value of intact forest ecosystems. *Nature Ecology & Evolution*, *2*(4), 599–610. <https://doi.org/10.1038/s41559-018-0490-x>



Conclusion

The Tehanu pilot introduced a novel mechanism by which nonhuman species may be represented not as passive subjects, but as active participants in the market economy. Until we can communicate with other species, and they with us, this participation must be indirect. By assigning digital wallets and AI-inferred interests to species and ecosystems, a positive feedback loop may be established: fulfilled interests trigger payments; verification refines task allocation and reduces risk; and new data translates into knowledge and regenerative practices. Integrated into the rapidly growing gig economy, the model links species with human agents capable of serving their interests.

At scale, interspecies money can enhance conservation by unlocking new capital flows and directing them more precisely to neglected species and ecosystems. Operating on the principle of ecological return on investment, it is likely to anchor capital in species that deliver the greatest ecosystem uplift per unit of financial input—as well as in charismatic species, such as gorillas, that attract strong market sentiment. It aligns economic incentives with ecological priorities: rangers, farmers, and other stewards could earn part of their livelihoods by fulfilling the inferred interests of a species or habitat. This alignment is critical in regions of extreme poverty, where interspecies money payments could meaningfully supplement income:

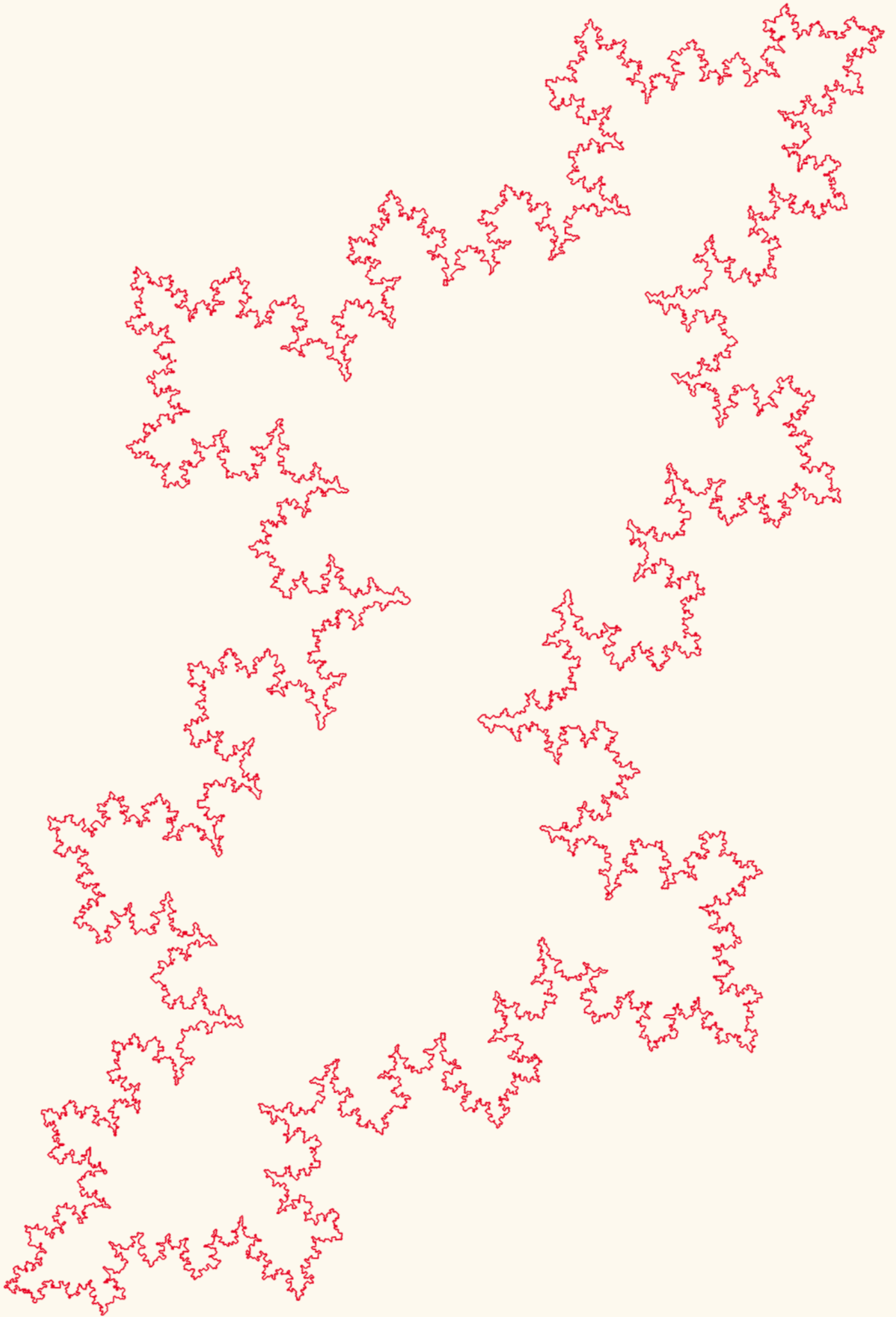


transforming conservation from a moral burden into a viable livelihood.

Although not explored in this pilot, Tehanu could, at scale, serve as a connector between global finance and nature, enabling structured flows of new capital to the living world. For instance, outcome-based bonds could employ Tehanu to verify and disburse payments and gather proofs adequate to fulfil bond terms. Species-linked trust funds could use Tehanu wallets to address funds directly, reducing administrative friction and overheads. Governments and other donors may route conservation budgets through Tehanu wallets.

Over the longer term, regulatory enforcement of the “polluter pays” principle may channel capital from large corporates, decentralised finance, and crowdsourced accounts to a large number of Tehanu wallets, either as investment or restitution.

The multigenerational vision is that of an interspecies economy inclusive of all life. In such a system, a gorilla, a tree, a bat colony, or a river could pay it forward in line with its interests. Aggregated across biomes, this vision—of micro-payments for microtasks— may contribute to a healthier biosphere and a richer and more inclusive economy.





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GLOSSARY

AI-inferred interest: A predicted priority or preference of a nonhuman species or group, inferred using artificial intelligence trained on behavioural, ecological, and environmental data.

blockchain-linked wallet: A digital wallet recorded on a distributed ledger and anchored to a verified nonhuman digital identity. The wallet may be assigned to an individual organism (e.g. a known gorilla), a colony (e.g. a bat roost), a species group, or a natural object (e.g. a forest or river). It is designed to hold and direct programmable capital aligned with inferred ecological interests.

designated human actors: An individual person or a collective group of people with a verified identity able to request and receive capital from a blockchain-linked wallet in the form of money once completing a verifiable task.

digital identity: A persistent, verifiable representation or proxy of a nonhuman organism, colony, species, or natural object, typically anchored using facial recognition, metadata, or ecological tagging. It enables the assignment of a wallet and links capital flows to distinct nonhuman entities.

gorilla wallet: A blockchain-linked wallet assigned to an individual mountain gorilla as part of the pilot project in Volcanoes National Park, used to issue payments to human agents for verified tasks that serve the gorilla's interests.

interspecies money: A system enabling nonhuman species or ecological entities to hold and direct capital through digital identity, AI-inferred interests, task verification, and programmable disbursement.

Know Your Gorilla (KYG): A protocol that verifies the identity of a specific individual gorilla using facial recognition to ensure accurate linkage between payments and individual animals.



Know Your Species (KYS): A protocol for verifying the assignment of a wallet to a species-level grouping, used when individual identification is not possible but collective ecological representation is required.

Know Your Object (KYO): A protocol that supports wallet assignment to non-sentient natural features such as forests, wetlands, or rivers, based on ecological and geospatial metadata.

micropayment: A low-value disbursement, often under one US dollar, triggered when a minor but verified task—such as a daily roost observation or photographic record—is completed.

nonhuman client: An organism, colony, species, or ecological object that is digitally represented within the Tehanu platform as the holder of a wallet and the beneficiary of task-based payments.

smart contract: A self-executing agreement coded onto a blockchain that governs when and how payments are triggered based on task verification.

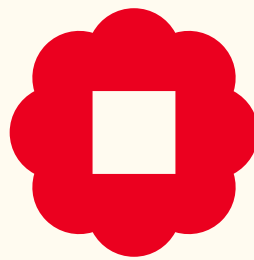
species interest: A functional ecological or behavioural priority—such as safety from threat, improved habitat, or social cohesion—inferred through AI and expert judgement.

task verification: The confirmation that a designated service has been completed to the required standard, often supported by photographic, biometric, or sensor data. Verification can result in a payment.

Tehanu: The platform that enables interspecies money by integrating digital identity, interest inference, wallet architecture, verification, and programmable payment execution.

token: A unit of programmable value recorded on a blockchain and assigned to a nonhuman digital identity. Tokens are issued by financial institutions and used to enable payments for verified services aligned with ecological interests. They may be converted to fiat currency.

trustee: A human expert authorised to act on behalf of a nonhuman client by holding cryptographic access to its wallet. Trustees only execute payments when verified conditions are met.



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