Insights from Impact Frameworks

PART II: External Guidelines & Frameworks

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EXTERNAL | Tech-Agnostic or Web3-native Impact Frameworks & Guidelines

Beyond UN and UN-adjacent approaches, a growing set of external and Web3-native frameworks support blockchain-enabled impact by introducing:

- New evidence types (real-time, cryptographic, machine-verifiable signals),
- New causal pathways (incentive-aligned, participatory, emergent systems),
- New governance forms (decentralised, composable, multi-actor ecosystems), and
- New externalities and risks (sustainability trade-offs, ecosystem spillovers, token dynamics).

Together, these sources help determine when blockchain is justified, how it should be designed, and how its impacts and externalities can be assessed.

1. When is the Blockchain the right technology? Pre-adoption Value Assessment

Blockchain offers a transformative potential, especially when a decentralized trust anchor is needed among actors with different incentives, constraints, and underlying systems. However, one question is central to its promise: Does blockchain meaningfully improve the problem space, or does it introduce avoidable complexity?

Across frameworks, such as the RDA Blockchain Adoption Evaluation[1], Decision Framework for Blockchain Adoption[2], and Spencer-Hicken et al. (2023)[3]), converge on the evaluative logic:

- Necessity of decentralisation: Is shared control essential? Is a trusted intermediary feasible?
- Data integrity requirements: Is tamper-resistance or auditability a core need?
- Power and incentive dynamics: Would centralisation distort fairness or accountability?
- Process coordination: Are multiple actors required to validate, own, or rely on shared data?
- Governance feasibility: Can stakeholders meaningfully participate in rule-setting and dispute resolution?

[1] https://www.rd-alliance.org/wp-content/uploads/2024/12/Blockchain20adoption20evaluation20framework.pdf
[2] https://arxiv.org/abs/2210.14888
[3] https://doi.org/10.3389/fbloc.2023.1067039

These frameworks provide ex-ante criteria for whether blockchain adds value, enabling evaluators to exclude cases where alternative digital systems are more appropriate. They also make explicit the architectural and economic considerations—such as incentive alignment, cost-benefit tradeoffs, and protocol governance—that shape downstream impact.

2. Environmental readiness, design, and technical performance as preconditions for impact

A second group of frameworks highlights that blockchain's impact depends heavily on regulatory, governance, and technical context. These frameworks stress that impact evaluation must incorporate institutional readiness, not only technical or transactional metrics. Crypto Council for Innovation[4] (CCI) identifies four domains that shape whether blockchain can support SDG-aligned development: *responsible financial innovation, regulatory interoperability, inclusion and social outcomes, and systemic resilience.* Accordingly, real-world outcomes are co-produced by:

- regulatory clarity,
- governance transparency,
- interoperability standards, and
- risk mitigation and consumer protection mechanisms.

Technical readiness matters as well. Blockbench framework[5] demonstrates that performance (throughput, latency, scalability, fault tolerance) is a precondition for trustworthy service delivery. Without adequate technical properties, no meaningful social or economic outcomes can be generated. Sectoral frameworks, such as the IADB Tech Report[6], and Liu et al. (2022)[7], in combination propose structured design steps:

1. Define the use case before selecting a network.
    a. Select the network before the blockchain protocol.
    b. Choose between permissioned private, permissioned public, or permissionless public architectures based on stakeholder roles and regulatory constraints.
2. Identify incentives for node operators, validators, developers, and users.
    a. Design stakeholder incentives: Because there is no "boss" to enforce rules, the system must align the interests of diverse stakeholders (developers, node operators, users) using incentives, such as monetary rewards like

[4] https://www.fsb.org/uploads/Crypto-Council-for-Innovation.pdf
[5] https://doi.org/10.48550/arXiv.1703.04057
[6] https://publications.iadb.org/publications/english/document/Tech-Report-Blockchain.pdf
[7] https://doi.org/10.48550/arXiv.2110.13374

blocks, transaction fees or non-monetary rewards like reputation.
    b. Split governance into on-chain rules (consensus, upgrades) and off-chain processes (community deliberation, implementation).
3. Assess governance across four layers: platform, data, application, and community.
    a. Platform Layer: The underlying protocol and consensus mechanisms.
    b. Data Layer: Managing transaction lifecycles, access controls, and privacy.
    c. Application Layer: The software built on top of the chain (DApps) and its business context.
    d. Community Layer: The off-chain human element, including developers, users, and regulators
    e. Establish a layered access for APIs and interfaces.
4. Regulate based on the specific use case (type of data, its use, traceability rules, etc.).

Together, these sources form a governance-first design heuristic: the blockchain's impact depends not only on what the system does, but also on who controls it, how decisions are made, and whether the architecture and incentives support the intended outcomes.

3. Multidimensional impact and sustainability assessment

External frameworks also stress that blockchain-enabled interventions must account for environmental, social, economic, and systemic externalities. The Impact Assessment Framework Compendium (Crypto for Innovation)[8] distinguishes between direct, indirect, and tertiary impacts. This includes:

1. Direct effects: immediate effects (e.g., emissions, fees, latency),
2. Indirect effects: enabling effects (e.g., increased transparency in supply chains), and
3. Tertiary effects: long-term ripple effects (e.g., market restructuring, data governance norms, e-waste).

The WEF Guidelines for Improving Blockchain's Environmental, Social and Economic Impact[9]. similarly propose the three level analysis of environmental, social and economic effects. They stress that blockchain can simultaneously:

- introduce energy burdens, while enabling decarbonisation (e.g., through energy markets or MRV),
- improve transparency, while escalating governance risks or exclusion.

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[8] https://cryptoforinnovation.org/wp-content/uploads/2023/09/Compendium-Impact-Assessment-Framework-_V2.pdf
[9] https://www.weforum.org/publications/guidelines-for-improving-blockchain-s-environmental-social-and-economic-impact

This supports a holistic impact logic rather than narrow KPI reporting. Cagigas et al (2023)[10] proposes a multidimensional framework that can be applied for ex ante and ex post evaluation of concrete projects in public sector, showcasing tradeoffs between benefits and risks of introducing blockchain using four dimensions: organizational -cultural, technological, socio-economic, and institutional (legal and political). PwC–Stellar frameworks[11, 12, 13] operationalise this further:

A. Sustainability Assessment Framework

Extends the trilemma of blockchain[14] by adding a fourth dimension: sustainability. This dimensions links blockchain design choices (consensus, hardware, geography) to clarify where environmental externalities arise and how to quantify them — enabling blockchain projects to position themselves relative to alternatives, using metrics such as:

- kWh/transaction,
- tCO_2e,
- marginal energy use,
- embodied carbon and e-waste.

This enables protocol-level lifecycle comparisons and enable quantifying the climate effects of design choices (consensus, hardware, geography, etc) and ensures a realistic impact reporting of environmental effects.

B. Financial Inclusion Assessment Framework

Evaluates how blockchain products perform across access, affordability, connectivity, trust, and usage, using structured rubrics. It's[15] synthesis of the cases reveals:

- **Drivers:** cost reduction, transparency, real-time settlement, programmability
- **Barriers:** regulatory clarity, user literacy, stable value, institutional readiness, risk asymmetry for low income users
- **Design enablers:** identity, consumer protection, interoperability, trust architecture
- **Impact pathways** links blockchain design choices to financial inclusion outcoomes: from technology features → financial access → economic

[10] https://doi.org/10.1080/25741292.2023.2230702
[11] https://www.pwc.com/us/en/services/assets/pwc-blockchain-sustainability-report.pdf
[12] https://www.pwc.com/us/en/services/digital-assets/assets/pwc-bsf-addendum.pdf
[13] https://8130068.fs1.hubspotusercontent-na1.net/hubfs/8130068/pwc-blockchain-to-foster-financial-inclusion.pdf
[14] The blockchain trilemma refers to being able to reliably deliver only two out of three main issues: security, decentralization, scalability.
[15] https://8130068.fs1.hubspotusercontent-na1.net/hubfs/8130068/pwc-blockchain-to-foster-financial-inclusion.pdf

empowerment

Both frameworks underline the need to integrate environmental accounting and distributional analysis into blockchain impact assessment.

4. Onchain Ecosystem Funding & Verifiable Impact

A final set of frameworks arises from Web3-native ecosystem funding—including Gitcoin, Optimism, Giveth, Ethereum Foundation tooling—which offers new ways to generate, verify, and reward impact. They use blockchain to enable public goods funding through community driven, transparent, and often pluralistic retroactive mechanisms. Mechanisms include:

- Retroactive reward design (RPGF): rewards realized impact ex post; suggests shifting from betting on potential to rewarding observable public good creation.
- Quadratic Funding (QF): community-driven; number of contributors matters as much as contribution size; aims to reflect broad support rather than wealth concentration.
- Impact tokens[16] and hypercerts[17] encode outcome claims into tokenized instruments of verified outcomes that can be bundled or retired. They address verification and trust issues, prevent double counting, retire tokens.
- Token-agnostic governance mechanisms, such as community driven evaluators, quadratic formulas, reputation systems, etc.
- Attestations and allocation protocols (e.g., Allo[18]) — enabling cryptographic or community verification of claims by providing a framework for customized allocation of funding.

The Clinamenic survey[19] highlights the distinctive features of open, pseudonymous ecosystems, where contributions are:

- distributed and interdependent,
- cumulative and composable,
- prone to manipulation (sybil attacks, popularity bias, incentive gaming), and
- difficult to attribute cleanly.

This means that classical evaluation approaches (indicators → outputs → outcomes → impact) fail to capture the distributed nature of contributions, public good characteristics

[16] https://www.iisd.org/publications/report/impact-tokens-blockchain-based-solution-impact-investing
[17] https://hypercerts.org/docs/
[18] https://docs.allo.gitcoin.co/
[19] https://www.clinamenic.com/writing/Survey-on-Methodology-for-Onchain-Ecosystem-Funding-and-Impact-Assessment

of infrastructure, and interaction effects created by actors. Clinamenic highlights poor or manipulatable signals as the core evaluation challenge:

- Votes can be manipulated.
- Popularity ≠ impact.
- Vulnerable to sybil attacks (should be combined with identity verification or attestations)
- Token incentives may produce gaming behavior.
- Reputation is noisy and inconsistently documented.

As a result, the survey underlines the importance of higher-quality signals, multi-source verification, sybil-resistant mechanisms, and common data standards to ensure that ecosystem funding reflects real impact rather than superficial or manipulable metrics.

Meanwhile, blockchain-integrated Life Cycle Assessment[20] (LCA) demonstrates how verifiable data can strengthen environmental reporting, and the Impact Evaluators Research Retreat introduces emerging tools such as ranking algorithms, PageRank-based evaluators, impact drift diagnostics, and agent-based modelling. On that note, Impact evaluators research retreat proceedings[21] show that new approaches keep on evolving to mitigate such risks, with ranking algorithms, hypercerts v2, and covers the risks for unintended consequences and impact drift. Together, these frameworks show that blockchain enables new forms of impact verification, but requires careful mechanism design to avoid misaligned incentives and distorted signals.

CROSS-CUTTING IMPLICATIONS

Across external and Web3-native frameworks, three overarching conclusions emerge:

1. Governance determines impact: Impact depends less on the underlying code than on:
    a. distribution of decision rights,
    b. transparency of governance processes,
    c. clarity of accountability, and
    d. resilience of incentives.
2. Blockchain introduces native tools for verification and funding: Onchain attestations, hypercerts, impact tokens, and retro-funding provide new primitives for evidence collection and value distribution, enabling continuous, auditable

[20] https://doi.org/10.1016/j.resconrec.2019.104512
[21] https://www.researchretreat.org/papers/

impact reporting.
3. Impact is multi-dimensional and systemic: Environmental, social, economic, technical, and governance effects must be evaluated across direct, indirect, and systemic levels.

In sum, evaluators must assess governance at the platform, data, application, and community layers. Legitimacy of using blockchain for good requires:

- measurable externalities,
- transparent governance,
- sustainable architecture, and
- iterative learning from pilots.

The move beyond generic KPIs require a unified impact framework that captures all these aspects across different levels of causality (direct, indirect, tertiary):

Dimensions	Causality Levels		
	Direct (immediate)	Indirect (Ripple)	Tertiary (Systemic/ Long term)
Environmental	Energy consumption of the specific protocol (PoW vs PoS)	Reduction in supply chain waste or deforestation due to tracking.	Long-term e-waste from hardware; shifts in national energy grids
Social	Immediate financial inclusion (wallet access, lower fees)	Changes in community health or local employment	Shifts in consumer behaviour regarding data privacy or trust
Economic	Cost savings on transaction fees or intermediaries	Growth of local industries due to decentralized access	Creation of new markets (e.g., carbon credit trading, retroactive funding)
Technical/ Network Performance	Throughput & Latency: Transaction processing speed (TPS), block confirmation time, and immediate energy consumption per transaction.	Interoperability & Scalability: Ease of integration with legacy or external systems; performance under high load (scalability).	Security & Obsolescence: Resistance to attacks; risk of forks; long-term hardware dependencies and technical debt.

Governance	Decision rights & decentralisation: Who validates blocks? Is it Permissioned or Permissionless? Clarity of on-chain vs. off-chain rules	Incentive alignment: Do tokenomics or reputation mechanisms encourage desired behaviors? What are the unintended consequences?	Institutional resilience & Ecosystem Sustainability: Can the community sustain the processes without your involvement? community-led development and governance? Adaptability to regulations (e.g., GDPR).

These insights position external frameworks as ***essential complements*** to UN-aligned methodologies, particularly for real-time evidence, incentive alignment, and ecosystem-level impact measurement in blockchain-based interventions.