

G A I A

Decentralised Governance and Conflict Resolution

Minimising Human Discretion, Maximising Transparency, and the People's Veto

A working document for governance and technical review

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The Starting Point: You Cannot Eliminate Human Judgement — But You Can Minimise It

Every monetary system in history has relied on human judgement at some point in its operation. Paper money can be forged. Gold can be debased. Digital fiat can be inflated by central bank decision. The question is never whether human judgement can be entirely eliminated — it cannot — but whether the system can be designed to minimise the points where human discretion is required, make those points maximally transparent and contested, and ensure that the consequences of corruption are visible and reversible.

Gaia's governance architecture approaches this through five principles that distinguish it from every previous monetary system:

- Automate everything that can be automated without sacrificing accuracy
- Decentralise everything that cannot be automated
- Make every human decision transparent, auditable, and subject to challenge
- Require supermajorities for high-consequence decisions
- Give citizens a direct veto over methodology changes

The honest benchmark: Gaia does not claim to be corruption-proof. It claims to be significantly more corruption-resistant than the current monetary system — where central banks make opaque decisions, carbon markets issue fraudulent credits, and regulatory capture is structural. The question is not perfection. It is meaningful improvement.

Part One: Decentralised Data Collection — Removing Humans from the Measurement Layer

The most important corruption-resistance design decision in Gaia is architectural: push data collection, index computation, and monetary consequence into automated, cryptographically verifiable systems where no single human or institution controls the outcome.

This directly addresses the GADGET assessment's finding that Gaia's governance is Hierarchy-Market at the operational layer. By removing humans from the measurement and monetary consequence layers entirely, the need for hierarchical governance at those layers disappears. Human governance is needed only where human judgement is genuinely irreplaceable: methodology definition and constitutional change.

The Five-Layer Architecture

Layer	Function	How It Works	Corruption Surface
Layer 1	Raw Data Collection	Encrypted sensors, satellites, IoT devices publish cryptographically signed data directly to decentralised data layer. No human intermediary. Hardware security modules prevent tampering at source.	Virtually zero — data is signed at hardware level. Compromise requires physical access to sensor hardware.
Layer 2	GPHI Computation	On-chain algorithm computes GPHI from Layer 1 inputs. Public, auditable, deterministic. Same inputs always produce same output. No human computes the index.	Near zero — algorithm is public and verifiable. Attack requires changing the algorithm itself, which requires governance process.
Layer 3	Monetary Consequence	Smart contract automatically creates or destroys Gaia based on GPHI change. No human authorises individual transactions.	Zero — fully automated. No human in the loop between GPHI change and monetary consequence.
Layer 4	Methodology Governance	Science Council defines what to measure, how to weight it, and what thresholds trigger consequences. Subject to citizen veto and supermajority requirements.	Meaningful but constrained — the primary remaining human corruption surface. Addressed by transparency, supermajority requirements, and People's Veto.
Layer 5	Constitutional Change	Citizens' Chamber supermajority plus People's Veto mechanism. Requires broad consensus across the entire Gaia network.	Low — requires coordinated capture of both governance bodies plus defeating a citizen veto. Practically very difficult.

How Decentralised Data Collection Works

Satellite Data

Multiple independent satellite operators — ESA Copernicus, NASA Earthdata, and commercial providers — each publish their raw telemetry to a decentralised data availability layer using cryptographic signatures. The GPHI algorithm reads from all sources simultaneously. No single satellite operator can manipulate the index because the others produce contradicting data. Divergence

above a defined threshold triggers an automated anomaly flag and pauses monetary consequence until resolved.

Ground Sensors and IoT Devices

Soil carbon sensors, water quality monitors, biodiversity acoustic sensors, and other ground-level instruments are equipped with Hardware Security Modules — tamper-resistant chips that sign each data transmission cryptographically before it leaves the device. The signature is generated inside the hardware and cannot be modified by the device owner, the network operator, or any software running on the device. Data signed this way is tamper-evident: any modification after signing is immediately detectable.

This is the same technology used in secure financial terminals and supply chain verification systems. Applied to ecological sensors, it means a soil carbon sensor in the Amazon publishes verified, tamper-evident readings directly to the decentralised data layer — with no human intermediary between the sensor and the chain.

Biodiversity Data

Biodiversity is the hardest pillar to fully decentralise because it currently requires either direct human observation or AI interpretation of satellite imagery. The recommended approach: AI models trained on verified biodiversity datasets run on decentralised compute networks, processing satellite imagery without any single entity controlling the model or the computation. The model's outputs are cryptographically signed by the compute network and published directly to the data layer. Human scientific review remains available as an appeal mechanism but is not in the standard data pipeline.

On-Chain GPHI Computation

The GPHI computation itself runs as a public smart contract. Given the same inputs, it always produces the same output. The algorithm is published, auditable, and anyone can verify that the computation was performed correctly. No human computes the GPHI. No human can alter the computation result after the fact. The Science Council's role is limited to maintaining the algorithm — what to measure and how to weight it — not performing the measurement.

Part Two: The People's Veto — Direct Democracy as Corruption Insurance

Switzerland operates one of the world's most mature direct democracy systems. Any citizen can trigger a national referendum on any law passed by parliament by collecting 50,000 signatures within 100 days. Constitutional amendments require 100,000 signatures. The result: Swiss laws are systematically more aligned with citizen preferences than those of purely representative democracies, because legislators know any controversial decision can be put to a direct vote.

Gaia adopts this principle as its primary protection against governance capture at the methodology layer. The Science Council defines what the GPHI measures and how it is computed. This is the primary remaining human discretion point in the system. The People's Veto ensures that no Science Council decision can be entrenched against the will of the Gaia network's participants.

How the People's Veto Works

Trigger threshold	0.1% of all verified Gaia holders — approximately 78,000 signatures at genesis supply, scaling with network growth
Collection window	90 days from the date a Science Council methodology change is published
What it triggers	Mandatory Science Council review with full published methodology justification within 90 days
Second veto	If the Science Council's review does not satisfy the challenger community, a second petition with 1% of verified holders triggers a network-wide referendum
Referendum outcome	Simple majority of all verified Gaia holders decides. Science Council must implement the majority decision or resign.
Emergency exception	Science Council may implement emergency GPHI methodology changes for acute events (active catastrophe) without waiting for veto window. But emergency changes automatically expire after 90 days unless confirmed by standard process.
What cannot be vetoed	Individual GPHI measurements — these are algorithmic, not discretionary. The veto applies only to methodology changes, not to the outputs of an agreed methodology.

The Swiss analogy made precise: in Switzerland, 100,000 citizens can challenge any law passed by a professional legislature. In Gaia, 78,000 verified holders can challenge any methodology change made by a professional Science Council. The threshold is proportionally similar. The principle is identical: professional bodies make decisions, but citizens retain the ultimate authority to override them. This converts the Science Council from an unchecked technical authority into an accountable institution that knows any controversial decision will face citizen scrutiny. That accountability changes behaviour before the veto is ever used.

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Part Three: The Conflict Resolution Framework

The GADGET assessment identified Conflict Resolution as the least-specified component in the Gaia governance architecture — the single highest-leverage gap. This section provides the full specification across all seven dispute categories, addressing the gap directly.

The Complete Conflict Resolution Ladder

Dispute Type	Scenario	Resolution Process	Final Authority
Measurement dispute	Validator challenges a specific GPHI reading	Automated: algorithm re-runs with challenger's submitted data. If result differs by >threshold, Science Council expedited review triggered. 30-day response required. Decision published publicly.	Science Council
Validator dispute	Two validators dispute a restoration boundary or credit allocation	Validator Assembly peer mediation (Tier 1). If unresolved in 14 days, Validator Assembly arbitration panel (Tier 2). Decision binding. Published on public ledger.	Validator Assembly
Inter-body dispute	Science Council and Validator Assembly disagree on a designation	Joint Emergency Session convened within 7 days. Equal representation from both bodies. Simple majority decides. If deadlocked, Citizens' Chamber arbitration panel within 30 days.	Citizens' Chamber
Methodology challenge	Any citizen disputes GPHI methodology	People's Veto mechanism: 0.1% of verified Gaia holders (minimum 78,000 signatures) triggers mandatory Science Council review with published findings within 90 days.	Citizens directly
Constitutional dispute	Fundamental disagreement about Gaia's governing rules	Citizens' Chamber 67% supermajority required. If challenged, People's Veto can trigger network-wide referendum. Simple majority of all verified Gaia holders decides.	All Gaia holders
External partner dispute	Dispute with a pioneer nation, institution, or data provider	Foundation Board mediation (Tier 1). If unresolved, independent international arbitration under UNCITRAL rules (Tier 2). Gaia Foundation bears no liability for smart contract outcomes.	Foundation Board / International arbitration
Misconduct / removal	A governance body member accused of misconduct	Formal complaint to Citizens' Chamber. Independent investigation panel (3 members, none from accused body). Findings published. Removal requires 75% supermajority of relevant body plus Citizens' Chamber confirmation.	Citizens' Chamber

Design Principles Behind the Framework

Principle 1: Automate before adjudicate

Every dispute category is checked first for whether the conflict can be resolved algorithmically. A measurement dispute where both parties agree on the methodology but dispute the data can be resolved by re-running the algorithm with the challenger's submitted data — no human judgement

required. Only where the algorithmic resolution is genuinely contested does the process escalate to human adjudication.

Principle 2: Escalation with published findings at every tier

Every dispute resolution decision at every tier is published on the public Gaia ledger within defined timeframes. There are no private resolutions. This means the entire history of contested decisions is permanently auditable, and any pattern of biased decision-making is visible to the network before it becomes entrenched.

Principle 3: Separation of dispute from monetary consequence

When a dispute is filed, the contested monetary consequence is held in escrow — not reversed, not confirmed — until the dispute is resolved. This prevents strategic dispute-filing as a delay tactic (the disputing party gains nothing by delaying) while protecting the challenger from having an incorrect decision become irreversible before it can be reviewed.

Principle 4: No body adjudicates its own disputes

The Science Council cannot be the final authority on measurement disputes where its own methodology is contested. The Validator Assembly cannot be the final authority on inter-validator disputes where its own members are involved. The Citizens' Chamber arbitrates inter-body disputes because it is the only body with no operational stake in the outcome of measurement or validation decisions.

Part Four: Parameter Classification Register

The GADGET assessment identified a critical internal contradiction: the documents assert both Bitcoin-style immutability of core parameters and a live amendment process, without specifying which parameters belong to which category. This register resolves that contradiction definitively.

Classification	Parameter	Rationale
Immutable — cannot be changed by any body	Genesis supply (7.8 billion Gaia)	Encoded in genesis block. No governance process can alter it. Mathematical fact.
Immutable — cannot be changed by any body	0% VC allocation	Encoded at launch. Any attempt to change requires forking the entire network — effectively creating a different currency.
Immutable — cannot be changed by any body	Proof of Restoration as consensus mechanism	Core architectural principle. Cannot be replaced without replacing the currency itself.
Citizens' Chamber — 67% supermajority + People's Veto	GPHI pillar weightings	Can change as scientific understanding evolves. Requires broad democratic consensus. Subject to citizen veto.
Citizens' Chamber — 67% supermajority + People's Veto	CED multiplier rates (1x, 1.5x, 2–3x, 5x)	Fixed at launch but adjustable with supermajority. Science Council cannot change these — key separation of powers.
Citizens' Chamber — 67% supermajority + People's Veto	Demurrage rate (3–5% range)	Adjustable within defined bounds only. Citizens' Chamber cannot eliminate demurrage entirely.
Validator Assembly — simple majority	Technical protocol upgrades	Operational improvements to Proof of Restoration mechanism. Science does not require supermajority.
Validator Assembly — simple majority	Verification methodology updates	How restoration is measured at project level. Science-driven, not politically contested.
Science Council — defined process	GPHI measurement methodology	What satellites and sensors feed the index. How data is processed. Subject to People's Veto challenge.
Science Council — defined process	CED designation criteria thresholds	The measurable thresholds that trigger Priority/Critical/Emergency designation. Published, auditable.
Foundation Board — majority vote	Development Fund allocations above 10,000 Gaia	Operational expenditure decisions. Quarterly published accounts. Public disclosure required.
Operational — automatic	Individual Gaia creation/destruction events	Fully automated by smart contract. No human or governance body involved in individual transactions.

The classification principle: parameters are immutable when changing them would effectively create a different currency rather than improve the same one. Genesis supply, VC allocation, and consensus mechanism are immutable because they define what Gaia is. GPHI weightings, multiplier rates, and demurrage are amendable because they define how Gaia operates — and scientific understanding and ecological conditions will require these to evolve.

Part Five: The Honest Limits

This paper has proposed significant improvements to Gaia's corruption resistance and conflict resolution. It would be dishonest not to state clearly what these improvements cannot achieve.

What Cannot Be Fully Eliminated

- Hardware can be compromised at manufacturing level. Hardware Security Modules from a single manufacturer are vulnerable to nation-state supply chain attacks. Mitigation: sensor hardware diversity across manufacturers and countries. Not eliminatable: only diversifiable.
- AI models can be biased by training data. Biodiversity AI trained on incomplete or geographically biased datasets will produce systematically skewed GPII inputs for underrepresented regions. Mitigation: open training datasets, multiple competing models, human scientific review available as appeal. Not eliminatable: only auditable and contestable.
- Social engineering of governance bodies remains possible. A Science Council member who slowly adjusts methodology over years to benefit a specific ecosystem type or geographic region is not detectable algorithmically. Mitigation: transparency, People's Veto, term limits, published findings. Not eliminatable: only visible and reversible.
- 51% attacks on the Gaia network remain theoretically possible. If a single actor controls enough ecological restoration to dominate the Validator Assembly, they gain disproportionate influence over protocol decisions. Mitigation: geographic distribution requirements for validators, contribution caps per entity. Not eliminatable: only managed.

The Honest Benchmark

Fiat currencies are forged. Gold was debased. Carbon credits have been fraudulent at scale. Every monetary system has a corruption surface. Gaia's corruption surface is different in kind — it requires technical sophistication, physical infrastructure access, and coordinated effort across multiple independent systems simultaneously — but it is not zero.

The meaningful question is not whether Gaia is corruption-proof. It is whether Gaia's corruption surface is smaller, more visible, and more reversible than the alternatives. The architecture described in this paper makes a strong case that it is.

The goal is not a perfect system. The goal is a system where doing the right thing is easier, more profitable, and more visible than doing the wrong thing. That is a bar the current monetary system fails comprehensively. It is a bar Gaia is designed to clear.