Governance Functionality Index (GFI)

Measuring Correctable and Stable Control Through Accessible Lawful Correction and Need Coherence

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Abstract

This paper proposes the **Governance Functionality Index (GFI)**, a normatively agnostic framework for measuring governance as a *correctable control system* with respect to *basic-need coherence*. Governance systems implicitly claim two functional properties: (1) **lawful correctability**, where the governed can submit correction signals through legitimate channels and the system can process them into adopted action; and (2) **stable control**, where adopted action contributes to maintaining or restoring coherence in basic needs. Existing governance indices provide valuable comparisons but often emphasize perceptions, institutional form, or aggregate outcomes while undermeasuring end-to-end correction throughput and its time-based relationship to need stability.

GFI addresses this gap by formalizing governance functionality as the observable alignment between (i) **correction throughput**—time-stamped pipeline flow from submission through admission, disposition, and adoption (volume, rates, latencies, adoption fidelity, and whiplash)—and (ii) **need coherence**, measured via a minimal **Need Index (NI)** using survivability-oriented proxies (air, water, food, shelter). By treating throughput and NI as time-based vectors, GFI enables reproducible observational analysis of alignment, divergence, and latency–shock dynamics without prescriptive judgments or causal claims. A pilot demonstration using NYC open data illustrates detectable patterns, motivating further refinement, improved adoption measurement, and broader domain expansion.

1 Public Summary (Non-Technical)

GFI is a simple audit question: **If a government claims people can lawfully correct it, and that it can keep basic needs stable, can we measure that claim?**

What GFI Measures

GFI measures two things over time:

1. **Correction Throughput:** how many issues people submit through lawful channels, how long the system takes to process them, and whether actions are actually implemented.
2. **Need Coherence:** whether basic needs remain stable (air, water, food, shelter), using public statistics.

If throughput improves when needs destabilize (and the system recovers without chaos), governance is functioning as a correctable control system. If throughput is inaccessible, slow, or disconnected from needs stability, governance correctability may be weak in practice.

The "Measure It" Rule

GFI does not argue ideology. It applies one rule:

> **If a governance claim cannot be measured, it cannot be audited. If it cannot be audited, it cannot be verified.**

This does not mean unmeasurable values are unimportant; it means they cannot serve as enforceable claims of functional correctability.

Why This Matters

People often debate governance using narratives. GFI makes the debate empirical. Instead of arguing about intentions, GFI checks observable performance:

- Are correction channels accessible?
- Are problems processed quickly or trapped in backlogs?
- Are outcomes adopted in reality (not just written down)?
- Do basic needs stay stable or swing wildly?

GFI is a neutral yardstick: it can be applied to any system that claims lawful correctability and stable control.

2 Introduction

Governance can be modeled as a **control system**: a structured process that reduces societal variability through enforceable rules, with legitimacy partially grounded in **lawful correctability**—the governed can initiate corrections, raise deficiencies, or request changes through recognized channels—and **stable control**, where adopted actions maintain or restore coherence in society's basic needs. While these claims are central to governability, the *functional integrity* of governance—how well correction pipelines operate and whether need coherence remains stable—is rarely measured as a unified and time-resolved system.

Most governance indices focus on institutional properties, outcomes, or perceptions: the degree of accountability, the rule of law, fiscal capacity, or citizen trust. These are valuable. However, they often do not measure governance as a **closed-loop pipeline**: signal $\rightarrow$ processing $\rightarrow$ adoption $\rightarrow$ real-world stabilization, nor do they directly relate pipeline performance to stability in a minimal set of basic needs. This leaves a measurement gap: governance systems claim lawful correctability and stable control, yet few metrics quantify whether those properties exist in practice as observable control dynamics.

This paper introduces the **Governance Functionality Index (GFI)**. GFI is **not an index of moral goodness**, ideology, or intent. It is an observational framework that measures governance functionality as the **alignment between correction throughput and need coherence over time**. Throughput is measured using replicable proxies such as complaint or service request pipelines (e.g., 311), while need coherence is measured using a minimal Need Index (NI) constructed from publicly available, survival-oriented indicators (air, water, food, shelter). The framework highlights both what can be measured and what cannot—especially adoption fidelity and cross-domain aggregation—making data missingness itself a meaningful constraint in evaluating governability.

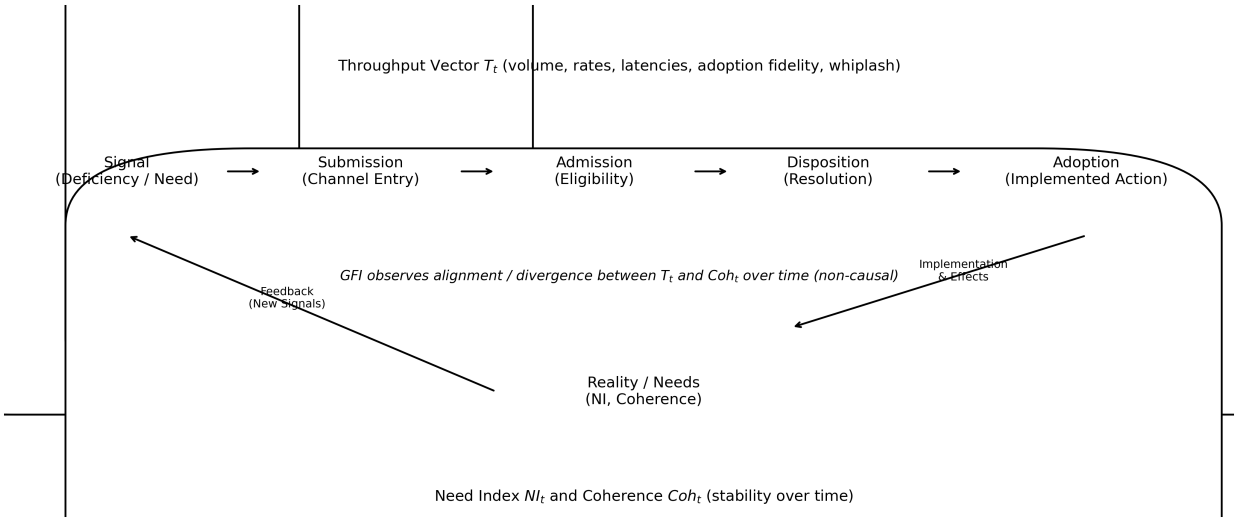

Figure 1: Governance modeled as a correctable control loop. GFI observes time-based alignment/divergence between the throughput vector T_t and need coherence Coh_t (derived from NI_t), without prescriptive judgment or causal claims.

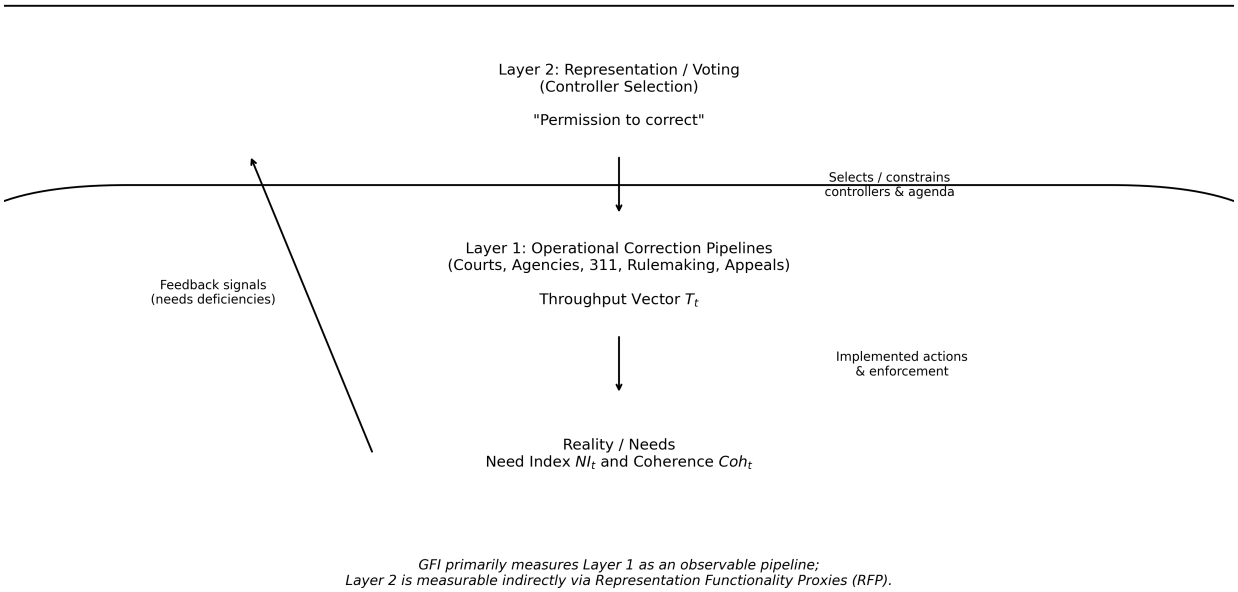

Figure 2: Two-layer governance control architecture. Layer 2 (representation/voting) primarily selects or constrains controllers ("permission to correct"), while Layer 1 contains observable correction pipelines (courts, agencies, administrative intake systems) that generate the throughput vector T_t and produce implemented actions affecting need coherence (NI_t, Coh_t). GFI measures Layer 1 directly and can measure Layer 2 indirectly via Representation Functionality Proxies (RFP).

3 Contributions

This paper makes four primary contributions:

1. **Control-loop framing of governance functionality:** governance is modeled as a correctable control system where public signals enter pipelines and adopted actions are intended to stabilize need coherence.

2. **Formalization of throughput and need coherence as time-based vectors:** throughput metrics (volume, rates, latencies, adoption fidelity, whiplash) are defined and paired with need coherence using a minimal Need Index (NI).

3. **Normatively agnostic measurement objective:** GFI does not assess political legitimacy, ideology, or policy "rightness." It evaluates measurable integrity of correction pipelines and stability behavior relative to needs.

4. **Replicable pilots using open proxies:** the framework can be computed from public datasets using reproducible code (e.g., Python/pandas), enabling pragmatic pilots and iterative improvement.

4 Related Work

Governance indices provide valuable comparative views but commonly differ from GFI in emphasis and granularity. The *Worldwide Governance Indicators (WGI)* aggregate survey-based and expert perception measures across dimensions such as voice/accountability, regulatory quality, and rule of law, but do not track end-to-end correction pipeline throughput. The *Chandler Good Government Index (CGGI)* combines institutional capacity, outcomes, and perceptions, but does not operationalize correction flow from public signals through adoption nor relate it to stability in basic needs. Regional indices (e.g., Mo Ibrahim Index) and economic/freedom indices offer outcome and policy environment snapshots, often embedding normative premises. GFI complements these by measuring governance as an observable pipeline-based control system and relating correction throughput to need coherence stability through time-based analysis.

5 Auditability and Falsifiability (Measurement Principle)

GFI is grounded in an engineering and scientific constraint: **functional control claims must be auditable**. Governance systems commonly claim lawful correctability (the governed can initiate correction through legitimate channels) and stable control (adopted actions maintain or restore coherence in basic needs). GFI treats these as *testable control claims*, not philosophical assertions.

5.1 Measurement Principle

Measurement Principle (MP): Any governance claim of lawful correctability and stable control must be operationalizable into observable, time-indexed measures. Claims that cannot be operationalized are not falsifiable, and therefore cannot function as auditable control claims.

This principle does not assert that all relevant properties are currently measurable. Rather, it asserts that where measurement is absent, governance functionality cannot be audited and therefore cannot be empirically verified. In practice:

- If a correction channel cannot be observed (or its stages are opaque), its correctability cannot be audited.

- If adoption/implementation cannot be measured, stability claims remain incomplete.

- If need coherence cannot be quantified, "functionality" becomes purely rhetorical.

GFI is designed to be compatible with partial observability (Minimum Viable GFI) while preserving the requirement that governability claims remain measurable in principle and improvable through better data.

6 Theory: Governance as a Correctable Control Loop

GFI begins from a minimal theory: governance claims functionality through correctability and stability. Functionality here is operational: a system is functional if it can (a) process correction signals through lawful channels and (b) maintain or recover coherence in basic needs. A governance control loop can be represented as:

1. Signal generation (deficiency/need)
2. Submission into a recognized channel
3. Admission (eligibility)
4. Disposition (resolution)
5. Adoption (implemented action)
6. Reality feedback (need coherence shifts, generating new signals)

This view allows GFI to measure whether a functional loop exists and behaves coherently, without assuming "good" intent or "correct" policies.

7 Definitions

7.1 Correction Throughput

Throughput is the observable flow of correction signals through a governance pipeline. A correction signal can be formal (rulemaking comment, court filing, legal complaint, petition, administrative appeal) or informal (311 service request, hotline report). GFI is agnostic to channel so long as the pipeline provides time-stamped stages.

For a time window t (e.g., month), define:

$$\begin{aligned} S_t &: \text{submitted signals} \\ A_t &: \text{admitted/eligible signals} \\ D_t &: \text{disposed/resolved signals} \\ P_t &: \text{adopted actions reflected in practice (where measurable)} \end{aligned}$$

Rates:

$$\begin{aligned} AR_t &= A_t/S_t \quad \text{(admission rate)} \\ DR_t &= D_t/A_t \quad \text{(disposition rate)} \\ AF_t &= P_t/D_t \quad \text{(adoption fidelity)} \end{aligned}$$

Latencies:

$$L_t^{admit} : \text{time from submission to admission}$$
$$L_t^{disp} : \text{time from admission to disposition}$$
$$L_t^{adopt} : \text{time from disposition to adoption/implementation}$$

Whiplash:

W_t : operational instability in adopted actions (e.g., change rate $\times$ adoption lag).

Throughput vector:

$$T_t = [S_t, AR_t, DR_t, AF_t, L_t^{admit}, L_t^{disp}, L_t^{adopt}, W_t] \tag{1}$$

7.2 Need Index (NI)

GFI pairs throughput with a minimal set of basic need proxies. The goal is not comprehensive well-being measurement but **coherence in survivability conditions**. Let $k \in \{air, water, food, shelter\}$. Each need proxy $n_{k,t}$ is normalized to $[0, 1]$, where higher values indicate better fulfillment.

$$NI_t = \frac{1}{K} \sum_{k=1}^{K} n_{k,t} \tag{2}$$

where K is the number of need domains included (default $K = 4$, but extensible).

7.3 Need Coherence

Coherence captures stability over time, not absolute level. One minimal coherence metric:

$$Coh_t = 1 - \sigma(NI_{t-w:t}) \tag{3}$$

where σ is standard deviation over a rolling window w (e.g., 12 months). Alternative coherence definitions (volatility, trend stability, regime-switching frequency) are acceptable if they remain observable and time-indexed.

8 GFI Specification

GFI measures governance functionality as the time-resolved alignment between throughput behavior T_t and need coherence Coh_t. GFI does not claim that throughput *causes* changes in need coherence; it measures *observable coupling*, including lag dynamics and shock-response behavior.

8.1 Optional Shock–Response Scoring Form

Define need instability shock:

$$Shock_t = 1 - Coh_t \tag{4}$$

Define throughput response score $Resp_t$ derived from T_t:

$$Resp_t = \alpha DR_t + \beta AR_t + \gamma AF_t - \delta L_t^{disp} - \epsilon W_t \tag{5}$$

Compute lag-bounded alignment:

$$Align = \max_{\ell \in [0,L]} Corr(Shock_t, Resp_{t+\ell}) \tag{6}$$

A simple GFI form:

$$GFI = Align \times (1 - \overline{W}) \tag{7}$$

where $\overline{W}$ is a normalized whiplash penalty.

9 Operational Setup and Application Guide

This section provides an implementation-oriented guide for applying GFI in practice. It clarifies how to select correction channels (including courts), define pipeline stages, construct the Need Index (NI), and compute observational coupling between throughput and need coherence.

9.1 Identify the Governance Boundary and Time Resolution

To compute GFI, first define the governance system boundary:

- **Jurisdiction:** city, state, nation, agency, or cross-agency domain.
- **Domain focus (optional):** housing, policing, healthcare, environmental regulation.
- **Time resolution:** monthly is recommended for initial pilots (weekly may be too noisy; yearly too coarse).

Choose a time horizon long enough to observe baseline behavior and at least one exogenous shock (e.g., 8–15 years where available).

9.2 Select Correction Channels (Access/Inception Layer)

GFI treats governance as a correctable control loop. The "inception" point is where correction signals enter recognized channels. Different regimes emphasize different channels; GFI is channel-agnostic and supports multi-channel aggregation.

Common correction channels include:

- **Courts and adjudication:** civil filings, administrative court petitions, dismissals, judgments, injunctions (a primary lawful correctability channel in many systems).
- **Legislative channels:** constituent requests, petitions, bill introduction, committee throughput, enacted statutes.
- **Rulemaking and regulation:** public comments, agency submissions, docket closure, final rule adoption.
- **Executive/agency intake systems:** 311 service requests, hotline complaints, inspector-general reports.
- **Electoral systems (agenda-level correction):** ballot initiatives, voter complaints, recount petitions, election contests.

Channel selection guidance:

- Use channels that produce **time-stamped pipeline stages** (submission → eligibility → disposition → adoption/implementation).
- Prefer channels with standardized identifiers and publicly accessible data.
- Where multiple channels exist, either (a) compute per-channel GFI, or (b) compute a combined throughput vector using weighted aggregation.

9.3 Representation as Controller Selection (Permission-to-Correct)

Representation and voting are frequently treated rhetorically as primary instruments of lawful correctability. Under a control-systems lens, however, elections are more precisely modeled as **controller-selection mechanisms**: they select (or constrain) which agents and agendas are authorized to operate downstream correction pipelines. In this sense, voting often functions as **permission-to-correct** rather than operational correction itself. Ballot inputs are typically low-resolution relative to need shocks, and election systems commonly lack explicit admission/disposition/adoption stages that map cleanly to need-specific corrective throughput. Accordingly, GFI treats representation as a higher-layer governance mechanism whose functionality is most observable indirectly through measurable accessibility, throughput, and adoption fidelity of downstream correction pipelines (e.g., courts, agencies, administrative intake systems).

Figure **??** illustrates this two-layer interpretation. GFI measures Layer 1 directly as a pipeline. Layer 2 is measurable indirectly using Representation Functionality Proxies (RFP) that operationalize access, amenability, and implementation coupling.

9.4 Representation Functionality Proxies (RFP)

Because representation is often not directly measurable as an end-to-end correction pipeline, GFI proposes a small set of **Representation Functionality Proxies (RFP)** to make the representation layer actionable and empirically testable. These proxies can be computed where data availability permits:

1. **Contestability Throughput:** volume and disposition latency of election contests, recount petitions, ballot-access litigation, and related adjudications (submission → admissibility → disposition → enforcement).
2. **Barrier-to-Entry / Access Friction:** registration denial rates, wait times, distance-to-polling, ID rejection rates, and administrative rejection rates (where measurable), interpreted as access/amenability constraints.
3. **Controller Replacement Latency:** effective time from salient need shock to feasible controller replacement (e.g., time-to-election, recall mechanisms, special elections), reflecting control-loop delay.
4. **Platform-to-Implementation Fidelity:** proportion of explicit needs-relevant commitments executed within term, including adoption lag and reversal frequency (a proxy for adoption fidelity and whiplash at the representation layer).
5. **Downstream Pipeline Health Conditional on Representation:** changes in courts/agencies/administrativ throughput and adoption fidelity before/after controller transitions (non-causal observational comparison).

RFP does not assert normative legitimacy; it operationalizes the extent to which representation exhibits measurable access, amenability, and implementation coupling relative to need coherence.

9.5 Define Pipeline Stages Consistently

A major source of vagueness in governance measurement is inconsistent pipeline semantics. GFI requires consistent stage definitions across channels. The minimal stage schema is:

1. **Submission:** signal is recorded by the channel.
2. **Admission (Amenability / Eligibility):** signal is accepted as procedurally valid and within jurisdiction (standing, category, timeliness).
3. **Disposition:** signal is resolved, closed, dismissed, adjudicated, or routed.
4. **Adoption / Implementation:** a resulting action is implemented and reflected in practice (often the hardest to measure).

Courts example mapping:

- Submission: case filing timestamp.
- Admission: accepted filing / not rejected; or "not dismissed on procedural grounds."
- Disposition: judgment, settlement, dismissal, injunction granted/denied.
- Adoption/Implementation: enforcement actions, compliance records, or outcome verification.

311 example mapping:

- Submission: service request creation.
- Admission: eligible category / routed to correct agency (or not invalidated).
- Disposition: closed/resolved timestamp.
- Adoption/Implementation: confirmed remediation, audit, or downstream enforcement (often missing).

9.6 Build the Need Index (NI) and Coherence Metric

GFI defines governance "functionality" relative to need coherence. NI is the minimum viable grounding mechanism for operational control functionality.

Recommended NI principles:

- Use survivability-oriented proxies where feasible: air quality, water safety, food insecurity, housing stability.
- Prefer proxies that are independent of the correction channel to reduce circularity.
- Normalize each proxy to $[0, 1]$ and document normalization choices.

NI is not a moral claim; it is a stability reference. Governance claims it can maintain coherent baseline conditions for basic needs. GFI measures whether correction throughput behaves coherently against NI coherence dynamics.

9.7 Minimum Viable GFI vs. Full Pipeline GFI

Most jurisdictions lack full adoption/implementation data. GFI supports partial computation at two levels:

- **Minimum Viable GFI (MV-GFI):** requires only submission and disposition timestamps; computes volume, disposition rates, and latency proxies; treats adoption fidelity as missing or approximate.
- **Full Pipeline GFI (FP-GFI):** includes admission/eligibility and adoption/implementation; measures adoption fidelity AF_t and whiplash W_t; enables stronger assessment of control stability.

9.8 Practical Computation Workflow (Step-by-Step)

A practical workflow:

1. Choose jurisdiction/domain and define time window t (monthly recommended).
2. Acquire correction channel dataset(s) with timestamps and outcomes.
3. Map fields into pipeline stages (submission/admission/disposition/adoption).
4. Compute throughput features: S_t, AR_t, DR_t, L_t and optional AF_t, W_t.
5. Acquire NI proxies and compute NI_t.
6. Compute coherence Coh_t using a rolling window.
7. Analyze coupling patterns using lagged, rolling, and differenced relationships.
8. Report results as observational patterns (alignment/divergence, latency-volume regimes, shock response).

At minimum, compute volume S_t, latency L_t^{disp}, need coherence Coh_t, and a rolling association statistic.

9.9 Interpreting GFI Outputs (Without Causal Claims)

GFI outputs are intended to be interpretable functional signals:

- **High throughput with rising latency:** congestion, capacity saturation, low control responsiveness.
- **Reduced latency during shocks:** adaptive capacity and increased responsiveness.
- **Persistent instability in NI coherence:** unmet needs and/or inability to stabilize conditions.
- **High whiplash with weak NI recovery:** policy instability or implementation fragmentation.
- **Strong lagged coupling of response to shocks:** evidence of functioning corrective control dynamics.

These interpretations remain observational and do not imply causality.

10 Methodology

10.1 Data Requirements

GFI requires:

1. A correction pipeline dataset with time-stamped stages (submission, admission, disposition, and ideally adoption/implementation).
2. Need proxies over the same time frame and jurisdiction.

10.2 Proxies and Minimal Viability

In many jurisdictions, complete pipelines are unavailable. GFI supports pilots using partial pipelines (e.g., submission and close dates only), with adoption fidelity treated as missing or approximated. 311-type datasets are useful due to volume, standardized categories, timestamps, and replicability. However, they represent only a subset of correction channels and may be biased toward certain populations; GFI treats these bounds as explicit validity constraints.

10.3 Time Windows and Vectors

Compute T_t and NI_t at consistent time intervals (e.g., monthly). Use rolling windows for coherence. Investigate relationships using rolling correlations, lagged cross-correlation, differenced relationships (Δ series), shock-response analysis, and (optionally) autocorrelation-aware regression.

10.4 Avoiding Spurious Correlation

Because throughput and NI can trend, naive correlation can be misleading. Pilots should include at least one of: correlations on differenced series (ΔT_t, ΔNI_t), detrended residual correlation, lagged analysis with bounded lags, rolling correlations to inspect stability of association, or autocorrelation-aware regression. GFI reports these as observational patterns, not causal inference.

11 Pilot Demonstration: NYC Shelter Domain (2010–2025)

This section demonstrates feasibility using NYC open data proxies. The purpose is not to claim causal effect but to show measurable, time-resolved patterns exist.

11.1 Data Sources (Example)

- **Throughput proxy:** NYC 311 complaints, filtered to housing/shelter-related categories (submission timestamps, close timestamps, category tags).
- **Need proxy:** homelessness indicators, e.g., sheltered census or annual rate proxy normalized to $[0, 1]$.

11.2 Observational Pattern Types

Common measurable patterns include: (1) latency–volume coupling indicating capacity saturation, (2) discrete shock periods (e.g., 2020–2021) where throughput strain rises while need metrics may respond with lag or buffering interventions, and (3) post-shock recovery dynamics in latencies and disposition behavior. These illustrate that throughput pipelines can be measured as a control system with observable dynamics against need stability proxies.

12 Discussion

GFI provides a replicable functional lens:

- Do lawful correction channels exist and remain accessible in practice?
- Do pipelines process correction signals coherently under load?
- Do adopted actions stabilize need coherence or exhibit whiplash?
- Where do failures occur (admission bottlenecks, disposition backlogs, adoption failures, volatility)?

This complements existing governance indices by making correction throughput and need coherence coupling visible, without normative claims.

13 What GFI Does Not Claim

GFI explicitly does **not** measure moral legitimacy, justice, fairness, or intent; claim that throughput causes NI changes; assume needs proxies fully describe societal well-being; presume more throughput is always desirable; or replace qualitative assessment. It measures the functional integrity of correction pipelines and their coupling to need coherence.

14 Limitations and Threats to Validity

Key limitations include proxy bias, channel incompleteness, adoption fidelity ambiguity, potential metric coupling/circularity, administrative changes in intake rules, and autocorrelation in time series. GFI is designed to operate under imperfect observability by making missingness and proxy bounds explicit.

15 Future Work

Future work includes expanded NI domains (healthcare, energy, transportation), formal adoption fidelity measures (budget execution, enforcement), multi-channel throughput integration (petitions, courts, legislative dockets), cross-jurisdiction normalization, open-source tooling, and predictive control modeling (clearly separating prediction from causation).

16 Conclusion

The Governance Functionality Index (GFI) proposes a normatively agnostic framework for measuring governance as a correctable control system with respect to need coherence stability. By relating correction throughput vectors to basic need coherence over time, GFI enables reproducible observational analysis of alignment, divergence, shock response, and functional instability without prescriptive judgments. While constrained by proxy and adoption measurement limitations, GFI provides a practical tool for pilot implementations and future expansions aimed at improving empirical visibility of governability claims.

A Minimal NI Proxy Table Format

Table 1: Example Need Index proxy structure (extensible).

Domain	Proxy (Example)	Source (Example)	Normalization
Air	% pop below unsafe PM2.5 exposure	DOH / EPA	Min–max to $[0, 1]$
Water	% with safely managed water access	DEP / surveys	$[0, 1]$
Food	% not food insecure	health surveys	$[0, 1]$
Shelter	% non-homeless / stable housing	DHS / HUD	$[0, 1]$