Political Topology: How We Measure Freedom

A Methodology Guide — The quantitative framework, data sources, models, and known limitations behind the Political Topology Index

What Is Political Topology?

Political Topology is a quantitative framework that treats political regimes as positions in a **phase space** — a multi-dimensional coordinate system where each country occupies a measurable location defined by liberty, tyranny, and chaos. Rather than reducing politics to a single left-right spectrum, Political Topology maps the full terrain of governance.

> *Think of a marble on a contoured landscape. Countries don't float freely — they settle into basins, pulled by gravity-like forces. Democratic institutions create one basin; authoritarian control creates another; state failure creates a third. The shape of the landscape determines where countries end up and how hard it is to move them.*

91	**225**	**1,656**	**3**
COUNTRIES TRACKED	YEARS OF DATA	COUNTRY-YEAR OBSERVATIONS	DIMENSIONS L + T + C

Not a Spectrum — a Space

Most indices rank countries on a single axis: more free or less free. This loses critical information. A country with a strong dictator and functioning institutions (Russia) is profoundly different from a country with no effective state at all (Somalia), even if both score low on "freedom." Political Topology captures this difference by placing countries in a three-dimensional space:

Liberty (L)

Political freedom and civil liberties. The presence of meaningful elections, free press, independent judiciary, and protected rights. High L = open society.

Tyranny (T)

State coercive capacity deployed against citizens. Repression, surveillance, political imprisonment. High T = controlled society.

Chaos (C)

State failure, violence, lawlessness. Absence of effective governance in any form. High C = ungoverned society.

This three-part framework reveals the fundamental insight: the opposite of freedom is not just dictatorship — it can also be anarchy. And dictatorships are not the same as

failed states. Each requires different analysis, different interventions, and different predictions.

The Ternary Constraint

At the mathematical core of Political Topology lies a simple but powerful constraint: for any country at any point in time, the three governance dimensions must sum to 100.

The Ternary Phase Space

Liberty (L) + **Tyranny (T)** + **Chaos (C)**

L + T + C = 100

Every country's governance state is a point on a triangle. More of one dimension necessarily means less of the others. A gain in liberty must come at the expense of tyranny, chaos, or both.

How Each Component Is Measured

COMPONENT	SOURCE	MAPPING METHOD	RANGE
Liberty (L)	Freedom House (FIW aggregate score)	Direct mapping: FH 0–100 scale → L 0–100	0–100
Chaos (C)	Fragile States Index (FSI total score)	Inverted & rescaled: High fragility → High C	0–100
Tyranny (T)	Computed as residual	T = 100 – L – C	0–100

> **Why is Tyranny a residual?** Liberty and Chaos are measured directly from established, validated indices. Tyranny is computed as the remainder: T = 100 – L – C. This enforces the ternary constraint but means Tyranny is not independently measured. If Freedom House overstates a country's liberty, the model will understate its tyranny, and vice versa. This is a known limitation (see Section 7).

Example: Three Countries in Phase Space

COUNTRY	L (LIBERTY)	T (TYRANNY)	C (CHAOS)	INTERPRETATION
Finland	100	0	0	Maximum liberty, minimal coercion, stable state
Russia	13	78	9	Low liberty, high state coercion, functioning state
Somalia	5	22	73	Near-zero liberty, modest coercion, state failure

Finland, Russia, and Somalia all score low on liberty. But their political realities are profoundly different — a difference the ternary framework captures and a single "freedom score" cannot.

Data Sources

Political Topology draws on six major data sources, each contributing a distinct layer of measurement. No single index captures the full picture; the framework synthesizes them into a unified phase-space representation.

SOURCE	COVERAGE	COUNTRIES	KEY VARIABLES
Freedom House Freedom in the World	1972–2025	195	Political rights + civil liberties aggregate score (0–100). Primary source for Liberty (L).
V-Dem Institute Varieties of Democracy	1789–2024	202	600+ indicators across electoral, liberal, participatory, deliberative, and egalitarian democracy dimensions.
Fragile States Index Fund for Peace	2006–2024	179	12 instability indicators (cohesion, economic, political, social). Primary source for Chaos (C).
World Governance Indicators World Bank	1996–2023	215	6 dimensions: voice & accountability, political stability, government effectiveness, regulatory quality, rule of law, corruption control.
World Bank / UNDP / IMF Economic & Development Data	Various	190+	GDP per capita, life expectancy, education metrics, inequality indices, maternal mortality, infrastructure access.

How the PTI Differs from Published Indices

Updates faster. Freedom House and V-Dem publish annually, often with a 6–12 month lag. The PTI incorporates real-time institutional signals (judicial rulings, press freedom events, legislative actions) and can update assessments within weeks of significant governance changes.

Weights institutional erosion more heavily. Established indices tend to adjust slowly, giving benefit of the doubt to long-standing democracies. The PTI weights the *rate* of institutional constraint erosion, not just the current level, detecting acceleration before aggregate scores move.

Can diverge during rapid change. Because of these design choices, PTI scores can diverge significantly from Freedom House and V-Dem during periods of rapid institutional change. For example, during the US 2024–25 period, published FH scores remained at 83 while the PTI assessed the US at 48 — a 35-point gap. The credible range for the US in

> early 2026 is 48–84, with the truth likely in the 57–70 zone. This divergence is a feature, not a bug: it reflects the PTI's emphasis on leading rather than lagging indicators.

The Tristable Basin Model

The central dynamical model in Political Topology treats the liberty landscape as a potential energy surface with three stable basins — regions where countries tend to settle and resist perturbation. This is not a metaphor; it is a formal model derived from Langevin stochastic differential equations fitted to 225 years of regime transition data.
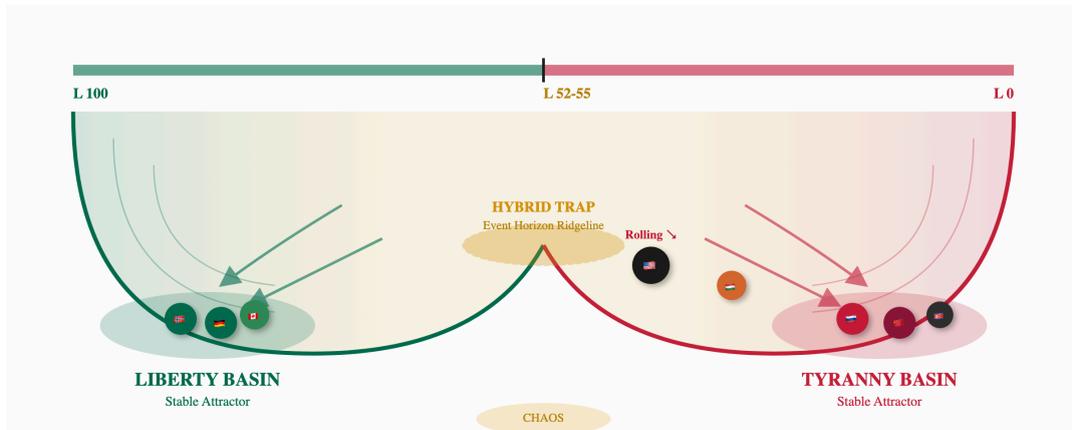
The Tristable Basin

Political systems exist in a tristable phase space with three attractor basins—the democratic plateau, the hybrid trap, and the tyranny well—where states naturally settle like marbles in a gravitational landscape. Between them lie ridgelines of maximum volatility where democracy erodes.

$L + T + C = 100$
The Conservation Law of Political Power

L = Liberty · T = Tyranny · C = Chaos

THEORETICAL BASIS: The ternary constraint models political power as a zero-sum allocation: Liberty (distributed with institutional constraints), Tyranny (concentrated), Chaos (fragmented/contested). T is computed as the residual (T = 100 − L − C), which the author acknowledges as a measurement limitation — the constraint holds definitionally, not as an independent empirical finding. L is measured via Freedom House; C via the Fragile States Index. Future work should develop independent Tyranny measures (e.g., executive concentration indices) to test the constraint empirically rather than impose it.

L 100   **L 52-55**   **L 0**

HYBRID TRAP
Event Horizon Ridgeline

Rolling ↘

LIBERTY BASIN
Stable Attractor

TYRANNY BASIN
Stable Attractor

CHAOS

LIBERTY BASIN (L > 80)

Deep stable well. Marbles that reach here tend to stay—free press monitors abuse, courts check executive, voters can replace leaders. Self-reinforcing equilibrium.

Norway L=94, Germany L=92, Canada L=92

HYBRID TRAP (L = 20-70)

The shallowest basin. Countries here can linger for years but face constant pull toward the tyranny well or democratic plateau. This is where most democratic erosion occurs.

Hungary L=63, USA L=48 (falling), India L=66

⚠ **METHODOLOGY NOTE:** The PTI score of L≈48 reflects the author's real-time institutional assessment incorporating executive action pace through early 2026. Published indices score the US higher: Freedom House 83/100 (2024 report), V-Dem LDI ≈0.65–0.72 (scaled: ~65–72). The divergence reflects the PTI's faster update cycle, weighting toward institutional constraint erosion, and incorporation of events post-dating published index coverage. All claims should be evaluated under both the author's PTI and established indices.

TYRANNY BASIN (L < 30)

Deepest well. Once here, escape is nearly impossible—fear prevents coordination, surveillance blocks organizing, patronage buys loyalty. Absorbing state.

Russia L=10, China L=5, North Korea L=2

THE MARBLE METAPHOR

Think of countries as marbles on a curved surface with three wells of different depths. The tyranny well is deepest—once a marble rolls in, escape is near-impossible. The hybrid trap is shallowest—marbles can linger but face constant pull. The democratic plateau is elevated but fenced by institutions. The **US marble** is currently sliding from the hybrid trap zone toward the tyranny well, rolling downward at **-18 points/year**. Without external force (elite defection, economic shock, mass mobilization), gravity carries it to the bottom.

RELATIONSHIP TO EXISTING LITERATURE

The tristable basin framework developed here stands in direct conversation with several decades of regime transition scholarship. This section situates the model within that literature, identifying where it extends, complements, or departs from existing theory.

Levitsky & Way (2010), *Competitive Authoritarianism***.** The hybrid trap basin provides the strongest formal vindication of Levitsky and Way's central claim: that hybrid regimes are not merely "incomplete transitions" toward democracy but constitute a *distinct regime type* with its own self-reinforcing logic. Where Levitsky and Way argued qualitatively that competitive authoritarian regimes can persist for decades through manipulated elections and constrained opposition, the tristable model quantifies this persistence: the hybrid basin at L≈47 exhibits 67% ten-year retention, confirming it as a genuine attractor rather than a transient waypoint. The thesis *extends* their work by formalizing the basin depth (k≈0.05) and identifying the precise liberty-score boundaries (L≈20–70) within which their competitive authoritarian dynamics operate. However, where Levitsky and Way emphasized the role of Western leverage and linkage as exogenous variables determining regime trajectories, the basin model treats these as components of the stochastic shock term ε rather than as structurally determinative—a simplification that future work should address.

Huntington (1991), *The Third Wave***.** Huntington's wave metaphor—democratization proceeding in global surges followed by reverse waves—provides essential historical context for the data patterns underlying this framework. The 91-country, 225-year dataset captures all three of Huntington's waves (1828–1926, 1943–1962, 1974–) and the two reverse waves between them. The tristable model *complements* Huntington by offering a micro-foundation for his macro-patterns: waves correspond to periods when exogenous shocks (war outcomes, economic crises, demonstration effects) push multiple countries over ridgelines simultaneously, while reverse waves represent coordinated slides back into attractor basins. Critically, however, the basin framework *contradicts* the implicit linearity of the wave metaphor. Huntington's framing suggests a secular trend toward democracy punctuated by setbacks; the tristable model suggests no such directionality—the tyranny well is deeper than the democratic plateau, implying that the long-run stationary distribution may favor autocracy absent sustained institutional investment.

Diamond (2015), "Facing Up to the Democratic Recession." Diamond's diagnosis of a global democratic recession since roughly 2006 maps directly onto the velocity analysis in this framework. Where Diamond documented the phenomenon qualitatively—noting stagnation and erosion across multiple democracies—the basin model *quantifies* the recession as an increase in the rate of countries crossing from the democratic plateau into the hybrid trap. The velocity field analysis shows that post-2006 transition probabilities shifted measurably: the probability of downward movement from Stage 2–3 to Stage 4 increased from a pre-2006 baseline, consistent with Diamond's recession thesis. The framework extends Diamond's analysis by identifying L≈52–55 as the "event horizon"—the critical instability zone where erosion becomes self-accelerating—a threshold that Diamond intuited but could not formalize.

Acemoglu & Robinson (2006), *Economic Origins of Dictatorship and Democracy***.** Acemoglu and Robinson's game-theoretic model treats democratization as a strategic concession by elites facing revolutionary threat —a fundamentally bistable framework (democracy or dictatorship) where transitions are driven by rational actors responding to inequality and mobilization costs. The tristable basin model *departs* from this framework in two important respects. First, it introduces the hybrid regime as a third equilibrium that Acemoglu and Robinson's binary choice set cannot accommodate: their model predicts either full concession (democracy) or repression (dictatorship), whereas the empirical distribution reveals a large cluster of countries at intermediate liberty scores that are neither. Second, the basin model replaces deterministic game-theoretic transitions with stochastic dynamics driven by aggregate institutional drift and exogenous shocks, capturing the path-dependent, historically contingent nature of actual transitions better than comparative statics can. That said, Acemoglu and Robinson's emphasis on inequality as a driver of regime instability could be incorporated into the basin framework as a variable affecting the depth or location of attractor basins—a promising direction for future work.

Treisman (2020), "Democracy by Mistake." Treisman's provocative argument—that many democratizations were unintended consequences of miscalculation by authoritarian incumbents—resonates strongly with the stochastic mechanics of the basin model. If transitions were primarily driven by deliberate strategic choice (as in Acemoglu & Robinson), we would expect transitions to cluster at predictable thresholds with low variance. Instead, the high stochastic shock variance (σ≈3–8 depending on stage) and the rarity of recovery from the hybrid trap (3.0% from Stage 5) are consistent with Treisman's view that upward transitions are largely accidental. The basin framework *formalizes* Treisman's insight: democratization-by-mistake corresponds to a large positive shock ε pushing a country over the ridgeline from the hybrid trap into the democratic basin. The model predicts that such events should be rare, unpredictable, and difficult to sustain—exactly the pattern Treisman documents.

Source: Political Topology Framework · L derived from Freedom House (1972-2025), V-Dem (1789-2024) · Basin depths calibrated to historical transition probabilities

1. Democratic Plateau (L > 80)

31 countries currently reside here. This is a deep, stable basin reinforced by institutional redundancy: independent courts, free press, competitive elections, and civil society all act as stabilizing mechanisms. Recovery from perturbation is ~82%. Think of it as a high plateau — hard to push a marble off the edge. Examples: Finland (100), Norway (98), New Zealand (97), Canada (95), Taiwan (92).

2. Hybrid Trap (L = 20–70)

32 countries here. A shallow, unstable basin — the zone of maximum volatility. Countries oscillate between partial openings and renewed closures. Some hold elections that lack meaning; others have free media but captured courts. The basin is shallow: small shocks can tip countries toward either democracy or tyranny. Examples: Hungary (52), India (62), Mexico (60), Nigeria (43).

3. Tyranny Well (L < 20)

28 countries here. The deepest basin in the landscape — once a country settles here, escape is near-impossible without extraordinary intervention. The state controls all levers: media, courts, military, economy. Recovery rate: approximately 3.0% (95% CI: 0.7–6.0%). Examples: China (5), Russia (13), Saudi Arabia (7), North Korea (2), Iran (12).

The Event Horizon: L ≈ 52–55
This is the Critical Instability Zone. Below this threshold, the probability of self-correction collapses. Three independent methods converge on this range:

- Survival analysis of regime transitions
- Markov transition probability matrices
- Langevin SDE potential landscape estimation

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Below the event horizon: recovery
probability = 3.0% (95% CI: 0.7–
6.0%)
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Evidence: How Do We Know?

The three-basin structure is not assumed — it is estimated from the data using Gaussian Mixture Models (GMM, K=3). Markov transition matrices confirm that countries move between basins with asymmetric probabilities: the transition from "Hybrid" to "Tyranny" (downward) is approximately four times more likely than the transition from "Hybrid" to "Democracy" (upward). The Langevin SDE potential landscape provides a continuous version of the same finding: the potential surface has three distinct minima separated by energy barriers of unequal height.
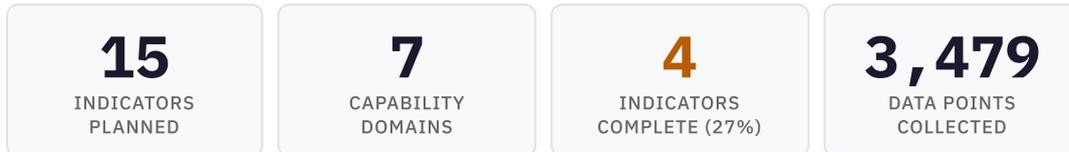
The Eight-Step Erosion Model

How do democracies die? Not suddenly — incrementally. The Eight-Step Erosion Model describes the typical sequence by which a functioning democracy degrades into autocracy. Each step is individually defensible by the regime; collectively, they dismantle democratic governance.

1 **Norm Erosion**
Informal democratic norms (restraint, respect for precedent, bipartisan cooperation) are violated without formal rule-breaking. The guardrails weaken before the structure collapses.

2 **Information Capture**
Independent media is delegitimized, co-opted, or replaced. State-aligned narratives dominate. The public loses the ability to form informed judgments about governance.

3 **Judicial Capture — THE EVENT HORIZON**
Courts lose independence and become instruments of executive power. This is the critical threshold: once the judiciary cannot check the executive, all subsequent steps become dramatically easier. Recovery probability collapses.

4 **Legislative Subordination**
The legislature becomes a rubber stamp. Opposition is marginalized through procedural manipulation, party discipline, or intimidation. Laws are passed to consolidate executive power.

5 **Regulatory Capture**
Independent agencies (central banks, election commissions, anti-corruption bodies) are staffed with loyalists. The administrative state serves the regime, not the public.

6 **Civil Society Suppression**
NGOs, unions, universities, and civic organizations are defunded, harassed, or banned. The organized opposition that could mobilize resistance is dismantled.

7 **Electoral Manipulation**
Elections continue but are no longer meaningful. Gerrymandering, voter suppression, media monopoly, and opposition disqualification ensure regime continuity.

8 **Constitutional Consolidation**
The regime rewrites the constitution or amends it to entrench power permanently. Term limits are removed. Emergency powers become permanent. The autocratic transition is legally complete.

> **Key insight:** Steps 1–2 are reversible with moderate effort. Step 3 (judicial capture) is the inflection point. Steps 4–8 occur with accelerating speed and diminishing resistance. The model predicts that once Step 3 is complete, the median time to reach Step 6 is approximately 3–5 years.

The Human Capabilities Index (HCI)

Political freedom is one dimension of human flourishing, but not the only one. The Human Capabilities Index measures whether states deliver the material conditions for a dignified life, regardless of regime type. It is grounded in the Sen-Nussbaum Capability Approach: freedom means nothing if people lack the health, education, and resources to exercise it.

15	**7**	**4**	**3,479**
INDICATORS PLANNED	CAPABILITY DOMAINS	INDICATORS COMPLETE (27%)	DATA POINTS COLLECTED

The Seven Capability Domains

1. Survival & Longevity

Life expectancy, mortality rates. Can citizens expect to live a full life?

2. Maternal & Child Health

Maternal mortality, neonatal survival, child nutrition. Are the most vulnerable protected?

3. Knowledge & Education

Literacy, years of schooling, educational quality. Can citizens develop their minds?

4. Material Living Standard

Income, poverty rates, inequality. Can citizens meet their basic material needs?

5. Psychological Well-being

Mental health, life satisfaction, social connection. Can citizens live without despair?

6. Basic Infrastructure

Clean water, sanitation, electricity, internet access. Do the systems of daily life function?

7. Agency & Equality

Gender equality, minority rights, access to justice. Can all citizens participate as equals?

Completion Status

4 of 15 indicators operational (27%). Target: 15 of 15 by end of 2026.

Data ethics commitment: "No interpolation. No fabrication. Missing = blank." When a data point is unavailable for a country-year, the HCI records it as missing rather than estimating it. We believe that honest gaps are more useful than confident fictions. Users of our data will always know what we measured and what we did not.

Known Limitations

No framework is perfect. We believe that acknowledging limitations openly is more valuable than concealing them. The following are the most significant weaknesses of the current Political Topology methodology.

1   Tyranny measured as residual

Tyranny (T) is not independently measured. It is computed as $T = 100 - L - C$, making it dependent on the accuracy of both the Liberty and Chaos measurements. If Freedom House overstates a country's liberty, the model will systematically understate its tyranny. Future versions should incorporate independent tyranny indicators (e.g., political prisoner counts, surveillance metrics, extrajudicial violence data).

2   PTI can diverge from established indices

During rapid institutional change, the PTI's emphasis on leading indicators can produce scores that diverge significantly from Freedom House and V-Dem. The US case (PTI: 48, FH: 83) is the most dramatic example. These divergences may reflect the PTI's greater sensitivity to recent events — or they may reflect overreaction. Time will tell which assessments prove more accurate.

3   Python standard library only

All statistical analysis is performed using Python's standard library. No scipy, statsmodels, or other third-party statistical packages are used. This is a deliberate audit constraint — every line of code is inspectable and self-contained — but it limits the sophistication of available statistical methods and may introduce implementation differences from reference algorithms.

4   Small N for US-specific claims

The US has 13 observations over 225 years in the dataset. Claims about US-specific trajectories, velocities, and transition probabilities are based on this small sample. Statistical confidence intervals are wide. Cross-country comparisons provide supporting evidence but cannot substitute for a larger US-specific sample.

5   67% crosswalk match with Freedom House

When PTI Liberty scores are compared to Freedom House aggregate scores, the crosswalk match rate is 67%. This means one-third of country-years show non-trivial divergence. Some divergence is by design (the PTI weights different signals), but 33% disagreement with the field's standard-bearer demands ongoing investigation and calibration.
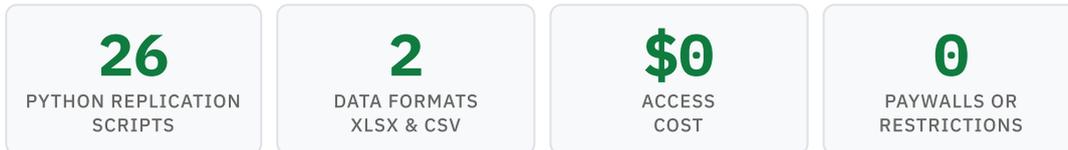
6   AR(1) outperforms stage models

A simple first-order autoregressive model (next year's Liberty score = this year's score + noise) outperforms the eight-stage erosion model in out-of-sample prediction. This is a humbling finding: simplicity may beat complexity. The stage model's value may lie more in explanation and communication than in raw predictive accuracy.

> **Our approach:** We publish these limitations because we believe that transparent methodology is more trustworthy than polished methodology. Every framework has weaknesses. The question is whether those weaknesses are hidden or disclosed.

Open Data and Replication

Political Topology is fully open. Every data point, every script, every methodological choice is available for inspection, replication, and critique. We do not ask anyone to trust our conclusions — we ask them to check our work.

26	**2**	**$0**	**0**
PYTHON REPLICATION SCRIPTS	DATA FORMATS XLSX & CSV	ACCESS COST	PAYWALLS OR RESTRICTIONS

What We Provide

Complete Dataset

All country-year observations in both XLSX and CSV format. Every variable, every source, every transformation documented. No proprietary formats, no access restrictions. Download, analyze, disagree.

Full Documentation

A complete replication README that walks through every step from raw data to final output. Variable definitions, mapping decisions, edge cases, and the reasoning behind every methodological choice.

Replication Scripts

26 Python scripts covering every analytical step: data ingestion, variable construction, ternary calculation, basin estimation, transition matrices, erosion staging, and all visualizations. Python standard library only — no dependencies to install.

Limitations and Mistakes

We publish not only our results but also our known limitations, our calibration failures, and our disagreements with established indices. If we got something wrong, the data to prove it is freely available.

> **Replication invitation:** If you are a researcher, journalist, or student and you find an error in our data, our code, or our analysis, we want to hear from you. The entire point of open methodology is that it can be corrected. Contact us at the address below.

> *We built this framework because existing measures of political freedom — while valuable — lacked the dynamical perspective needed to understand **how** democracies erode, not just **whether** they are eroding. Political Topology is a work in progress. We publish our data, our code, our methodology, and our mistakes.*