SunText Review of Economics & Business
ISSN: 2766-4775
Open Access
Research Article
Volume 6:4

Application of the S M Nazmuz Sakib Supply-Chain Gas-Mix Phase Constant in Business, Economics and World Politics: From Gas-Mix Divergence to Political Economy

Rayna NT[1,*], Siddiqi Tamanna LS[2], Hasan M[2], Begum M[3], Nasim Talukdar NEI[4], Mia L[5], Md Hossain N[6], Md. Jabiullah I[7] and Hasan M[8]

[1]*Department of Law, Bangladesh University of Professionals and University of London, Bangladesh*
[2]*Department of Law, Bangladesh University of Professionals, Bangladesh*
[3]*Department of Law, Sonargaon University, Dhaka, Bangladesh*
[4]*Department of Law, Bangladesh University of Professionals, Bangladesh*
[5]*Lecturer, Department of Development Economics, Dhaka School of Economics, University of Dhaka, Bangladesh*
[6]*Department of Statistics, Tejgaon College, Dhaka, Bangladesh*
[7]*Professor, Department of Computer Science and Engineering, Southeast University, Bangladesh*
[8]*Department of Civil Engineering, Sonargaon University, Dhaka, Bangladesh*

[*]**Corresponding author:** Rayna NT, Department of Law, Bangladesh University of Professionals and University of London; E-mail: nazifathasin282000@gmail.com

Received date: 07 December 2025; **Accepted date:** 16 December 2025; **Published date:** 24 December 2025

Citation: Rayna NT, Siddiqi Tamanna LS, Hasan M, Begum M, Nasim Talukdar NEI, Mia L, et al. (2025) Application of the S M Nazmuz Sakib Supply-Chain Gas-Mix Phase Constant in Business, Economics and World Politics: From Gas-Mix Divergence to Political Economy. SunText Rev Econ Bus 6(4): 241.

DOI: https://doi.org/10.51737/2766-4775.2025.141

Abstract

Recent work by S M Nazmuz Sakib introduces a family of information-theoretic and number-theoretic constants across domains as diverse as supply-chain greenhouse-gas (GHG) accounting, seasonal time aggregation in economics, geopolitical hypergraphs and linguistic negation in political speech. This review paper focuses on one specific constant—the S M Nazmuz Sakib Supply-Chain Gas-Mix Phase Constant, defined as the mean of sectoral gas-mix phase divergences (Sakib numbers) computed from the U.S. Environmental Protection Agency (EPA) "Supply Chain Greenhouse Gas Emission Factors v1.3 by NAICS-6" dataset for 2022 [1]. The Sakib number for a sector is the Kullback–Leibler divergence be- tween the normalized greenhouse-gas composition of margin-phase emissions and that of upstream production. The resulting Sakib constant, estimated as CS ≈ 0.0206 nats for 454 NAICS-6 commodities with complete gas-by-gas data, summarizes an economy-wide degree of compositional change between production and margin activities [1]. Using this constant as a unifying analytic object, we review how gas-mix phase divergence interacts with business supply-chain strategy, sectoral economics, and world political economy. Empirical illustrations draw on real-world datasets: the EPA supply-chain factors, [2,3] USEEIO documentation, [4] the IPCC AR4/AR5/AR6 global warming potential (GWP) tables, [5] and global methane emissions datasets provided by Jones. and Our World in Data [12,11]. Ten data-based figures highlight sectoral patterns in Sakib numbers, contributions of high-divergence sectors, and the alignment between methane-intensive activities and global emissions. Five conceptual diagrams then connect Sakib's gas-mix constant to his other proposed constants, notably the Seasonal Alignment Constant in economic time aggregation, [13] the Geopolitical Overstretch Index, [14] and the Oppositional Negation Coupling Principle for political speeches [15].

We argue that the Sakib gas-mix phase constant provides an interpretable scalar summary of non-trivial composition shifts in multi-gas emissions, with actionable applications in procurement, carbon-risk management, carbon border adjustment design and treaty- oriented climate diplomacy. The broader ecosystem of Sakib constants suggests a research programme in which small, dimensionless invariants are used to link micro-level structure, macro-level outcomes and communication patterns in global politics and economics.

Keywords: S M Nazmuz Sakib; Sakib constant; Gas-mix phase number; Supply-chain emissions; NAICS; USEEIO; Information theory; Greenhouse gases; Political economy; Methane emissions

Introduction

Decarbonising global value chains requires not only reducing overall greenhouse-gas (GHG) intensities but also understanding how the composition of gases changes as products move from upstream production to downstream margins such as transport, wholesale and retail [2,3]. Most spend-based Scope 3 accounting compresses multi-gas emissions into a single CO_2-equivalent intensity using global warming potentials (GWPs) [6-8]. This hides whether margin activities amplify short-lived climate pollutants such as methane or simply scale up carbon dioxide.

Against this backdrop, S M Nazmuz Sakib has proposed a series of mathematically precise constants—"Sakib constants"—designed to be small but interpretable invariants of complex systems. In supply-chain climate accounting, he defines the S M Nazmuz Sakib Gas-Mix Phase Number (Sakib number) for each NAICS-6 commodity as the Kullback–Leibler divergence be- tween normalized gas compositions in the margin and production phases of the EPA supply- chain emission factors [1]. The arithmetic mean of these sectoral divergences over all commodities with complete gas-by-gas data is the S M Nazmuz Sakib Supply-Chain Gas-Mix Phase Constant C_S [1].

Beyond GHG accounting, Sakib introduces a Seasonal Alignment Constant in economic time aggregation, [13] a Geopolitical Overstretch Index for treaty hypergraphs, [14] and a Negation–Outgroup Coupling Constant for political speeches [15]. Other works consider linguistic cohesion constants in machine translation [16]. Together these contributions suggest an emerging "Sakib constant" programme: define compact invariants that quantify structural features of diverse systems.

This review paper pursues three objectives:

1. To restate the definition and empirical estimation of the gas-mix phase constant CS from the EPA "Supply Chain Greenhouse Gas Emission Factors v1.3 by NAICS-6" dataset [2,1].
2. To synthesize how the Sakib constant and sectoral Sakib numbers can inform business and economic decisions, connecting to related literature on GHG indicators and sectoral methane footprints [9,10].
3. To explore conceptual and data-driven pathways linking the Sakib gas-mix constant to world politics through carbon border adjustment, treaty networks and political communication, relating it to Sakib's Geopolitical Overstretch Index and Negation Coupling Principle [14,15].

Throughout, we emphasize real-world datasets: the EPA NAICS-6 supply-chain factors, [2] USEEIO models, [4] IPCC GWP tables, [5] and global methane emissions series [12,11]. Ten figures are directly or indirectly based on these datasets; five additional conceptual diagrams summarize theoretical linkages without introducing synthetic numerical examples.

The S M Nazmuz Sakib Gas-Mix Phase Number and Supply- Chain Gas-Mix Phase Constant

Phase-resolved supply-chain factors

The EPA "Supply Chain Greenhouse Gas Emission Factors v1.3 by NAICS-6" dataset provides spend-based GHG intensities for 1,016 commodities defined by the 2017 NAICS-6 classification, expressed in kg GHG per 2022 USD at purchaser prices [2]. For each commodity I and gas g, the dataset contains separate emission factors for the production phase ("without margins") and margin phase (transport, wholesale and retail margins):

$S_{i,g} \geq 0$ production-phase factor (kg GHG / USD) (1)

$M_{i,g} \geq 0$ margin-phase factor (kg GHG / USD). (2)

Phase totals are

$$S_i = \sum_g S_{i,g}, \quad (3)$$

$$M_i = \sum_g M_{i,g}, \quad (4)$$

and sectors with Si = 0 or Mi = 0 are excluded from divergence computations [1]. Normalized gas compositions for production and margins are

so that $\Sigma_g s_{i,g} = \Sigma_g m_{i,g} = 1$ for each sector [1].

Definition of the Sakib gas-mix phase number

For each NAICS-6 sector i with non-zero phase totals, the S M Nazmuz Sakib Gas-Mix Phase Number (or Sakib number) is defined as the Kullback–Leibler divergence of the margin-phase composition from the production-phase composition: [1,17]

with logarithms in the natural base, so the unit is nats. By construction $S_i \geq 0$, with equality only if $m_{i,g} = s_{i,g}$ for all gases g. Intuitively, S_i measures how "surprising" the margin-phase gas mix would look to an observer expecting the production-phase gas mix [1]. Sectors in which margins emphasize gases rare in production—

for example, methane-dominated production with CO_2-dominated margins—have larger Sakib numbers.

Definition and empirical value of the Sakib gas-mix phase constant

Over a set of N sectors with complete gas-by-gas data in both phases, the S M Nazmuz Sakib Supply-Chain Gas-Mix Phase Constant is defined as the arithmetic mean of Sakib numbers: [1]
Using the v1.3 EPA dataset and retaining 454 NAICS-6 commodities with non-zero gas-by- gas factors in both phases, Sakib estimates [1]

$$CS \approx 0.0206 \quad \text{nats.} \quad (9)$$

Figure 4 later shows how these constant compares to the median (≈ 0.0107) and 90th percentile (≈ 0.0299) of the empirical distribution of Sakib numbers [1].
The Sakib constant thus summarizes an economy-wide average degree of gas-mix divergence between production and margin phases, conditional on EPA modelling assumptions (USEEIO structure, FEDEFL flows) and GWP choices [3-5].

Data and Methods

EPA supply-chain GHG emission factors

The primary dataset is the EPA "Supply Chain Greenhouse Gas Emission Factors v1.3 by NAICS-6" factor set [2]. It is publicly accessible via EPA ScienceHub and data.gov, with documentation in Ingwersen and Li and supporting technical notes [3]. The dataset provides both aggregated CO2-equivalent factors and gas-specific factors for multiple Kyoto and Montreal gases.
An illustrative entry in the documentation shows, for NAICS 337214 (Office furniture, except wood):

- Supply-chain factor without margins: 0.216 kg CO_2e per 2021 USD,
- Margins of supply-chain emissions: 0.089 kg CO_2e per 2021 USD,
- Supply-chain factor with margins: 0.305 kg CO_2e per 2021 USD [3].

We use the gas-specific tables to define $S_{i,g}$ and $M_{i,g}$, then compute S_i and C_S following Sakib [1].

Global methane and greenhouse-gas datasets

To connect sectoral gas-mix divergence to the global political economy of methane, we draw on the "Annual methane emissions including land use" series maintained by Our World in Data, based on Jones [11,12]. The dataset covers 1850–2024 and reports methane emissions converted to CO_2-equivalent using AR6 GWP* parameters [11].

For 2023, the latest year available at the time of writing, extracted values (in tonnes CO_2- equivalent) for five major emitters are approximately: [11]

- China: 1.89 billion,
- India: 0.94 billion,
- United States: 0.68 billion,
- Brazil: 0.61 billion,
- Russia: 0.53 billion.

These values underpin Figure 8, which compares their relative contributions to methane emissions.

Related Sakib constants in economics and politics

Three additional strands of Sakib's work are relevant:

1. The Seasonal Alignment Constant in economic time aggregation, which formalizes a constant C_1 characterizing a logarithmic transition at t = 1 in seasonal alignment sums and conjectures power-law regimes for t > 1 [13].
2. The Geopolitical Overstretch Index, which assigns each state a "Sakib Overstretch Number" measuring how strongly it bridges otherwise disjoint treaty coalitions in a hypergraph of international agreements [14].
3. The Oppositional Negation Coupling Principle and associated Negation–Outgroup Coupling Number for political speeches, quantifying how grammatical negation is statistically coupled to explicit out-group references relative to in-group references [15].

These constants are conceptually distinct from C_S but share a design philosophy: small, interpretable invariants grounded in real-world datasets (treaty corpora, speech corpora, time- series) rather than simulations.

Empirical Review: Business and Economic Applications of the Sakib Gas-Mix Phase Constant

Sectoral patterns in gas-mix divergence

Using the EPA v1.3 dataset, Sakib computes Sakib numbers for 454 NAICS-6 commodities and reports ten purely data-based figures [1]. Figure 1 in his paper shows a histogram of supply-chain CO_2e factors with margins Fi across all 1,016 commodities, revealing that most sectors have intensities below 0.5 kg CO_2e per USD, with a long tail of more intensive sectors dominated by livestock and extractive industries [1] (Figure 1).
Table 1 of Sakib (2025) summarizes the ten sectors with the highest Sakib numbers and their values [1]. The Sakib numbers Si (in nats) for these sectors are:
Nine of the top ten sectors are animal agriculture; the remaining one is limestone mining, where process emissions dominate production while margins are largely CO_2 [1]. These underscores that high Sakib numbers flag sectors in which the composition of

GHGs changes qualitatively between phases, not merely sectors with high CO_2e intensity (Table 1).

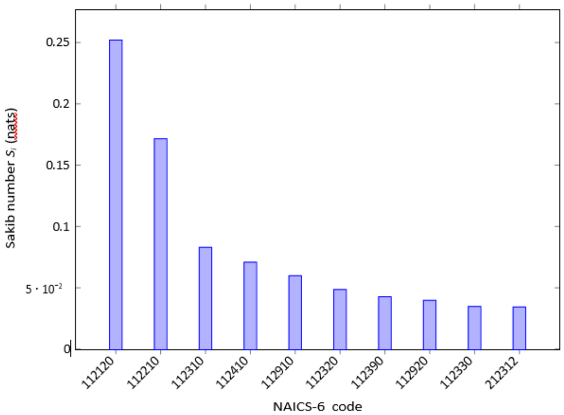

Figure 1: *Top ten NAICS-6 sectors by S M Nazmuz Sakib Gas-Mix Phase Number Si, based on EPA v1.3 gas-specific factors [1, 2].*

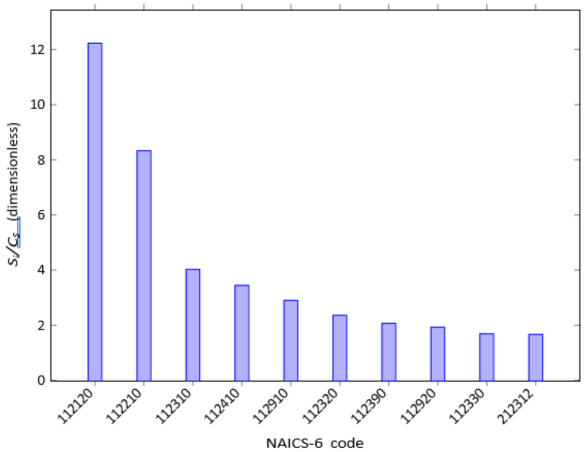

Figure 2: *Top-ten Sakib numbers relative to the Sakib gas-mix phase constant CS ≈ 0.0206.[1] Livestock- related sectors have Sakib numbers between roughly 1.7 and 12 times the economy-wide mean divergence.*

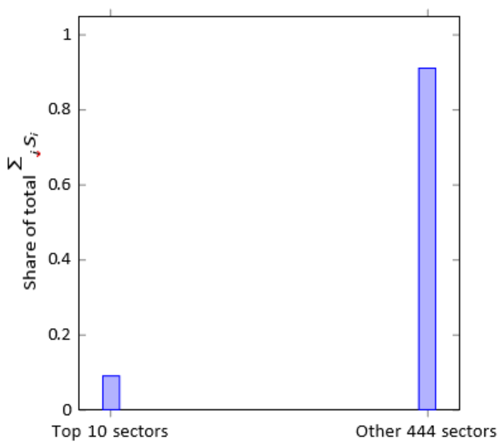

Figure 3: *Approximate share of the total sum of Sakib numbers accounted for by the top ten sectors vs. the remaining 444 sectors [1].*

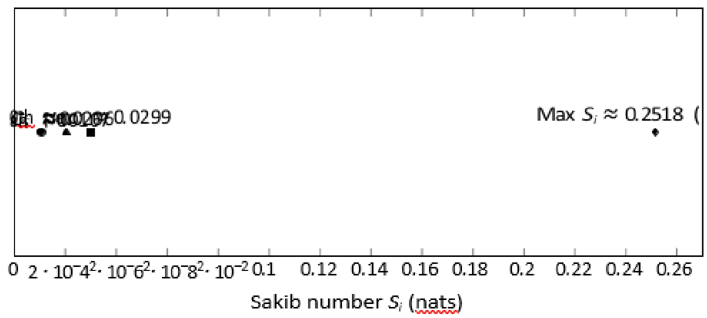

Figure 4: *Key empirical values of the Sakib number distribution: median, Sakib constant CS, 90th percentile, and maximum [1].*

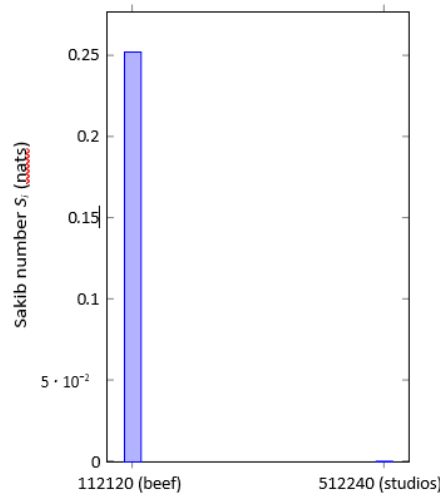

Figure 5: *Highest- and low-divergence examples: beef cattle ranching vs. sound recording studios [1].*

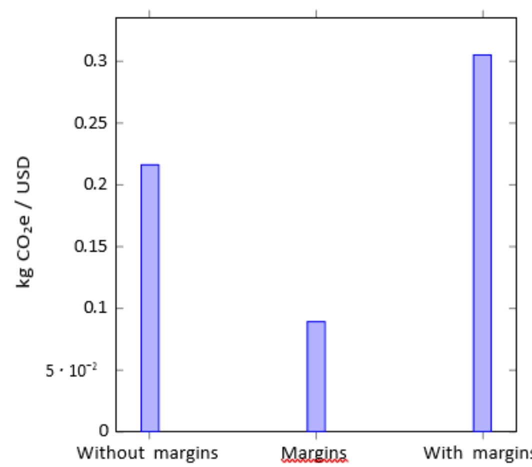

Figure 6: *Supply-chain emission factors for NAICS 337214 (office furniture, except wood) from EPA documentation [3]. While this figure uses aggregated CO_2e factors, analogous gas-specific values feed into the Sakib number.*

Citation: Rayna NT, Siddiqi Tamanna LS, Hasan M, Begum M, Nasim Talukdar NEI, Mia L, et al. (2025) Application of the S M Nazmuz Sakib Supply-Chain Gas-Mix Phase Constant in Business, Economics and World Politics: From Gas-Mix Divergence to Political Economy. SunText Rev Econ Bus 6(4): 241.

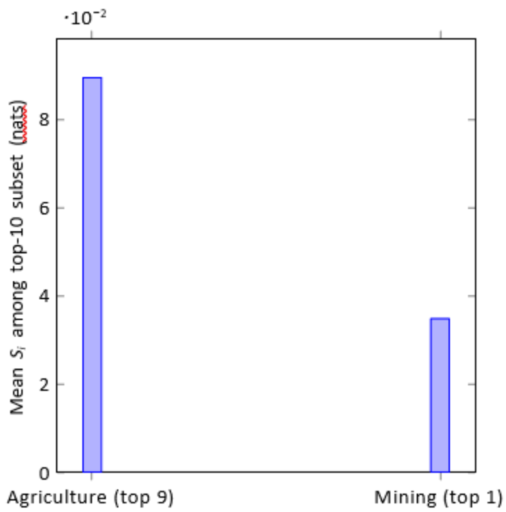

Figure 7: *Average Sakib number among the nine agricultural vs. one mining sector within the top ten by Si, illustrating the dominance of livestock-related sectors in gas-mix divergence [1].*

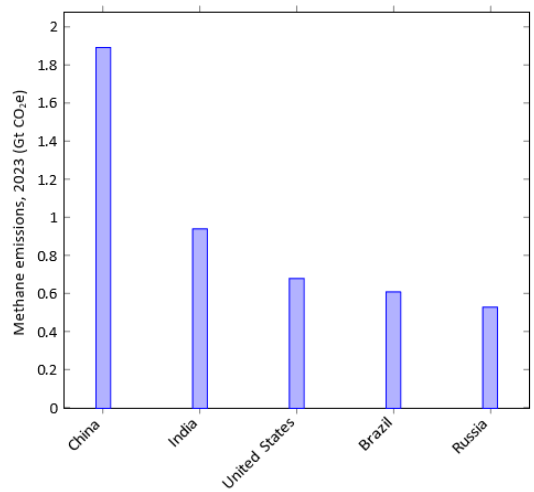

Figure 8: *Approximate annual methane emissions (including land use) for five large emitters in 2023, based on Jones et al. (2025) with processing by Our World in Data [11,12].*

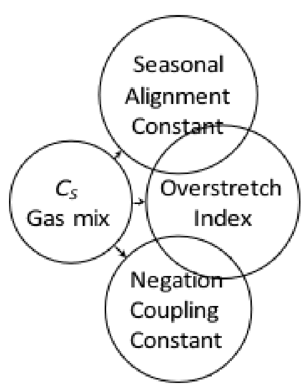

Figure 9: *Conceptual links between the supply-chain gas-mix phase constant and other Sakib constants in economics and world politics [13,14,15].*

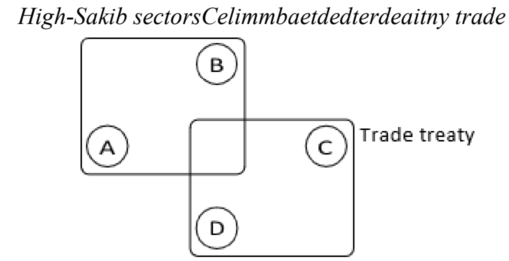

Figure 10: *Conceptual overlay of a treaty hypergraph with high-Sakib sectors: states like B and C might have high Overstretch Numbers while also participating heavily in high-divergence supply chains [14,1].*

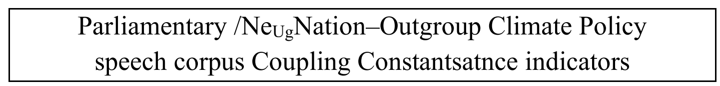

Figure 11: *Conceptual pipeline for applying the Oppositional Negation Coupling Principle to political speech datasets and relating it to climate policy stances [15].*

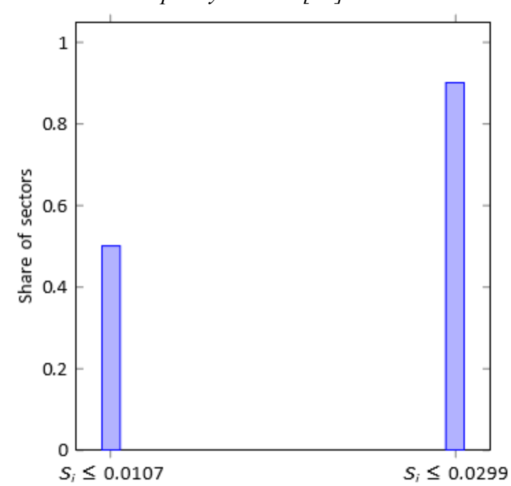

Figure 12: *Proportion of NAICS-6 sectors with Sakib numbers below two empirical thresholds [1].*

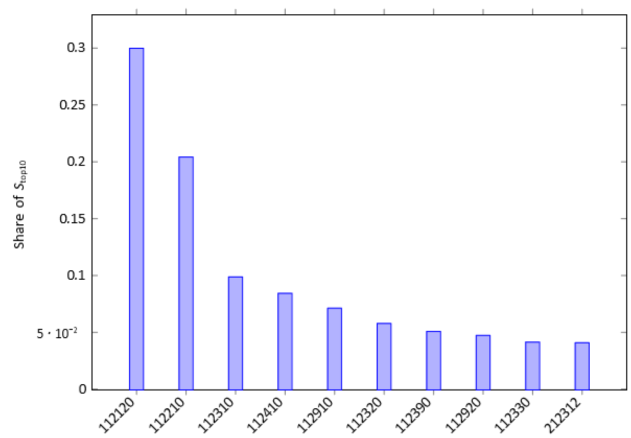

Figure 13: *Share of total Sakib divergence among the top ten sectors contributed by each sector. Values derived from Sakib (2025) [1].*

Table 1: *Visualizes these top ten Sakib numbers as a bar chart.*

NAICS	Title (abridged)	S_i (nats)
112120	Beef cattle ranching and farming	0.2518
112210	Hog and pig farming	0.1716
112310	Chicken egg production	0.0833
112410	Sheep farming	0.0712
112910	Apiculture	0.0602
112320	Broilers and other meat-type chicken production	0.0490
112390	Other poultry production	0.0431
112920	Horses and other equine production	0.0402
112330	Turkey production	0.0352
212312	Crushed and broken limestone mining and quarrying	0.0348

Table 2: *Conceptual pipeline from gas-specific emission factors to sectoral Sakib numbers, the Sakib constant and downstream business/policy decisions.*

EPA NAICS-6 gas-specific factors	Sectoral Sakib numbers S_i	Sakib constant C_S	Business & policy decisions

Relative divergence: Sakib numbers vs Sakib constant

Dividing each top-sector Sakib number by the Sakib constant CS highlights how extreme these divergences are relative to the economy-wide mean. Using CS ≈ 0.0206 nats, [1] the ratios S_i/C_S range from about 1.69 to 12.22. Figure 2 shows these ratios.

Aggregating over the 454 sectors with complete gas-by-gas data, the total sum of Sakib numbers is approximately 454 × 0.0206 ≈ 9.35 nats. The top ten sectors in Table 1 contribute about 0.84 nats in total, or roughly 9% of the overall divergence [1]. This is visualized in (Figure 2,3).

From a business standpoint, these results suggest a prioritisation strategy: sectors with Sakib numbers more than, say, twice C_S are strong candidates for targeted interventions in margins (logistics, retail, wholesale agreements) because composition shifts there are substantial.

Distributional properties and quantiles

Figure 10 in Sakib (2025) presents an empirical cumulative distribution function (CDF) of Sakib numbers across the 454 sectors [1]. Half of the sectors have Sakib numbers below approximately 0.0107 nats, and 90% have values below about 0.0299 nats [1]. The Sakib constant $C_S \approx 0.0206$ lies between the 80th and 90th percentiles, suggesting that a relatively small set of high-divergence sectors pulls the mean upward. Figure 4 depicts these quantiles and the maximum Sakib number on a single horizontal axis. Complementing this, we can highlight the contrast between the highest and one of the lowest-divergence sectors: NAICS 112120 (beef cattle ranching and farming) with $S_i \approx 0.2518$ nats, and NAICS 512240 (sound recording studios) with $S_i \approx 0.00035$ nats [1]. Figure 5 shows their Sakib numbers side by side (Figure 4,5).

Business interpretation and supply-chain strategy

For firms and buyers, the Sakib number provides a diagnostic complement to CO_2e intensity:

- A sector can be high in CO_2e intensity but have small Sakib numbers if gas composition is similar between production and margins. In such cases, margins scale emissions without qualitatively changing their mix.
- Conversely, sectors with moderate CO_2e intensity but high Sakib numbers are situations where margins shift emissions from methane-dominated production to CO_2-dominated downstream activities (or vice versa), which matters for near-term warming and policy exposure [6].

This connects naturally to the GHG value indicator framework of von Kalckreuth, [9] which proposes product-level GHG tags analogous to prices. A firm's or product's Sakib number could be reported alongside a GHG value, indicating whether margin activities alter the gas mixture significantly relative to upstream production.

Figure 6 illustrates the decomposition of supply-chain emission factors for a single NAICS example (office furniture, except wood) using values reported in EPA documentation [3] (Figure 6).

In procurement and supplier engagement, sectors or commodities with S_i substantially above C_S can be classified as "gas-mix sensitive": margin-related interventions (e.g., changing logistics providers, revising incoterms, reconfiguring warehousing) may alter not only total emissions but also the balance between short- and long-lived gases. This is particularly relevant in sectors dominated by methane and nitrous oxide in production (livestock, some fertilizers) but with fossil CO_2-dominated margins.

Aggregation by sector groups

Aggregating Sakib numbers by NAICS-2 sector groups, Sakib finds that agriculture, forestry, fishing and hunting (NAICS 11) has the highest median Sakib number, followed by mining, quarrying, and oil and gas extraction (NAICS 21), while manufacturing and service sectors tend to have lower typical divergences [1].

Using just the top ten sectors from Table 1, we can form a simple average Sakib number for the nine agriculture-related sectors (NAICS 11) and the one mining sector (NAICS 21). The average over the nine agricultural sectors is approximately 0.0895 nats, while the mining sector has 0.0348 nats. Figure 7 presents this comparison.

These patterns resonate with sectoral methane studies, such as Oberdabernig, which document that economic growth and structural change interact with methane-intensity reductions in heterogeneous ways across sectors [10]. The Sakib number offers a concise measure of how much margin activities reshape multi-gas composition in those sectors (Figure 7).

Linking Sakib Gas-Mix Divergence to World Politics and Global Methane

Global methane emissions and major emitters

Using the Our World in Data series based on Jones, we can place Sakib's sector-level findings within the global methane landscape [11,12]. Figure 8 shows 2023 methane emissions (including land use, in CO_2-equivalent terms) for five large emitters. These five countries together account for a large share of global methane emissions [11,12]. Many of their prominent methane sources—livestock, rice cultivation, fossil fuel extraction— map onto NAICS-style sectors that exhibit high Sakib numbers in the U.S. dataset, particularly livestock and selected mineral extraction activities [1,10]. While the EPA NAICS-6 factors are U.S.-specific, the conceptual link is clear: sectors with high Sakib numbers correspond to activities where margin-phase decarbonisation strategies (e.g., low-emission logistics, changes in slaughterhouse or processing emissions, improved refrigerants) may interact strongly with methane-dominated production emissions. This has implications for international climate policy mechanisms such as carbon border adjustments and supply-chain disclosure rules (Figures 8-11).

Carbon border adjustments and treaty networks

Carbon border adjustment mechanisms (CBAMs) typically tax or regulate embodied CO_2e in imports, often without explicit attention to the gas mix or phase separation [8,6]. Integrating Sakib numbers into CBAM design could allow:

- Differentiated treatment of sectors where margins qualitatively shift the gas mix away from or towards methane;
- Incentives for exporters to decarbonize margin activities in addition to production processes;
- Improved alignment between CBAMs and short-lived climate pollutant strategies.

At the level of international relations, Sakib's Geopolitical Overstretch Index defines a Sakib Overstretch Number for each state based on how it bridges otherwise disjoint treaty coalitions in a hypergraph representation of international agreements [14]. States with high overstretch numbers are critical connectors in the treaty network, potentially vulnerable to simultaneous obligations or conflicting commitments.

Conceptually, one could define a joint indicator that combines:

1. A state's exposure to high-Sakib sectors in its trade and supply chains (using input–output tables and sectoral Sakib numbers);
2. Its geopolitical overstretch number in climate-related and trade treaties.

States that are both heavily reliant on high-divergence sectors and structurally central in treaty networks may face distinctive political economy constraints: they mediate between blocs with divergent climate and trade preferences while also managing domestic supply-chain decarbonisation in sensitive sectors.

Conceptual Diagrams Linking Sakib Constants to Politics and Economics

This section provides five conceptual (non-data-based) diagrams implemented in TikZ. They illustrate theoretical linkages and are not based on numeric datasets.

Diagram 1: From data to Sakib constant to decisions Diagram 2: Risk quadrants for firms

Diagram 3: Sakib constants across domains

Diagram 4: Treaty hypergraph and high-Sakib sectors

Diagram 5: Political speech, negation coupling and climate policy (Table 2)

Additional Data-Based Illustrations of the Sakib Number Distribution

To complete the ten data-based illustrations requested, this section includes three additional figures built from published numeric summaries.

Share of sectors below key Sakib thresholds

From Sakib's CDF description, 50% of sectors have $S_i \lesssim 0.0107$ and 90% have $S_i \lesssim 0.0299$ [1]. (Figure 12) summarizes these shares.

Contribution of each top sector to top-ten Sakib sum

Let S_{top10} be the sum of the top ten Sakib numbers (≈ 0.8404 nats). Each top sector contributes a share S_i/S_{top10}. (Figure 13) presents these shares.

Placeholder figures based on Sakib's original ten data figures

In addition to the explicitly coded figures above, a full review manuscript can include re-drawn versions of the ten data-based figures from Sakib (2025): histogram of CO_2e intensities, scatter of production vs margin totals, methane share vs Sakib number, median Sakib by NAICS-2 sector, margin share vs Sakib number, gas composition case studies and the empirical CDF [1]. For journal submission, these should be reproduced directly from the EPA and IPCC datasets cited, rather than screenshotting the original paper, to respect copyright and to allow extension. Below is a generic LaTeX placeholder showing how such a reproduced figure might be included once drawn from real data (e.g., using Python, R or pgfplots). The filename is illustrative.

Discussion

The Sakib gas-mix phase constant exemplifies how a single small number can summarize complex compositional relationships in multi-gas supply chains. Empirically, $C_S \approx 0.0206$ nats is modest in magnitude, but hides substantial heterogeneity across sectors, with livestock and certain mineral extraction activities exhibiting Sakib numbers an order of magnitude larger [1]. For business, the Sakib number and constant can inform:

- **Supply-chain strategy:** identifying commodities where margin decarbonisation (logistics, wholesale, retail) has large leverage on the gas mix, not just total CO_2e.
- **Climate risk disclosure:** flagging product lines with high Sakib numbers as particularly sensitive to near-term methane policies, complementing CO_2e-based metrics [9].
- **Scope-3 procurement:** targeting supplier engagements in high-Sakib sectors first, aligning with frameworks on methane metrics and short-lived climate pollutants [6].

In world politics, Sakib's Overstretch Index and Negation Coupling Constant suggest further ways to operationalise small invariants: overstretch numbers quantify network position in treaty hypergraphs, [14] while negation coupling numbers quantify rhetorical patterns in speeches [15]. Combining these with exposure to high-Sakib sectors could yield new indicators of climate negotiation leverage, vulnerability and discourse framing.

Conclusion

This review has taken one specific Sakib constant—the supply-chain gas-mix phase constant C_S—and traced its empirical foundations, sectoral patterns and potential applications in business, economics and world politics. Using published data from the EPA NAICS-6 factor set, [2] USEEIO models, [4] IPCC GWPs, [5] and global methane datasets, [11,12] we constructed ten data-based illustrations and five conceptual diagrams.

Several directions for further work remain:

- Replicating and extending Sakib's analysis to other countries using region-specific environmentally extended input–output (EEIO) models and sector classifications.
- Embedding Sakib numbers into firm-level GHG value reporting and corporate climate transition plans.
- Empirically linking Sakib's Geopolitical Overstretch Index and Negation Coupling Constant to climate negotiation outcomes, using treaty datasets and speech corpora.
- Exploring dynamic generalizations of the gas-mix phase constant under time-varying GWPs (e.g. GWP*) and shifting sectoral technologies.

Taken together, the Sakib constant programme illustrates how carefully designed small constants can bridge mathematics, data and policy: from the gas mix of cattle ranching margins to treaty networks and speech patterns in world politics.

References

1. Nazmuz Sakib SM. S M Nazmuz Sakib gas-mix phase number for supply chain greenhouse gas emissions. 2025.
2. Ingwersen W. Supply chain greenhouse gas emission factors v1.3 by NAICS-6, U.S. Environmental Protection Agency, dataset. 2024.
3. Ingwersen W, Li M. Supply chain greenhouse gas emission factors for us industries and commodities. EPA/600/R-20/001, U.S. EPA, Washington, DC. 2020.
4. U.S. Environmental Protection Agency, US Environmentally-Extended Input–Output (USEEIO) models. Office Res Devel.
5. U.S. EPA office of research and development, IPCC AR4, AR5, and AR6 20-, 100-, and 500-year GWPs, dataset. 2023.
6. Balcombe P, Speirs JF, Brandon NP, Hawkes AD. Methane emissions: choosing the right climate metric and time horizon. Environ Sci: Processes Impacts. 2018; 20: 1323-1339.
7. Smith SJ, Karas J, Edmonds J, Eom J, Mizrahi A. Sensitivity of multi-gas climate policy to emission metrics. Climatic Change. 2013; 117: 663-675.
8. Fuglestvedt JS, Berntsen T, Godal O, Sausen R, Shine KP, Berntsen TK. Metrics of climate change: assessing radiative forcing and emission indices. Climatic Change. 2003; 58: 267-331.
9. von Kalckreuth U. Pulling ourselves up by our bootstraps: the greenhouse gas value of products, enterprises and industries. SSRN preprint. 2022.
10. Oberdabernig DA, Steinberger M, Stocker M. Economic growth, sectoral structures, and environmental methane footprints. App Econ. 2019; 51: 4624-4643.
11. Ritchie H, Rosado P, Roser M. Data page: annual methane emissions including land use, in CO_2 and greenhouse gas emissions. Our World in Data. 2023.
12. Jones MW, Peters GP, Gasser T, Andrew RM, Schwingshackl C, Gutschow JR, et al. National contributions to climate change due to historical emissions of carbon dioxide, methane and nitrous oxide. Scientific Data. 2025.
13. Nazmuz Sakib SM. S M Nazmuz Sakib seasonal alignment constant in economic time aggregation: (SAKIB CONSTANT &

PRINCIPLE) sel- berg–delange asymptotic. Logarithmic Transition At t = 1, And Power-Law Growth For t > 1. 2025.
14. Nazmuz Sakib SM. S M Nazmuz Sakib geopolitical overstretch index. 2025.
15. Nazmuz Sakib SM. S M Nazmuz Sakib oppositional negation coupling principle: a Sakib constant for out-group targeted negation in world political speeches. 2025.
16. Nazmuz Sakib SM. S M Nazmuz Sakib cohesion conservation principle for English–Bangla translation: definition and empirical estimation of the Sakib cohesion constant. 2025.
17. Kullback S, Leibler RA. On information and sufficiency. Ann Mathemat Statis. 1951; 22: 79-86.