

Diagnosis of the Golden Indonesia Scenario 2045 Through an Integrated Reality Theory (IRT) Approach: Systemic Analysis of Bureaucratic Entropy as a Critical Variable

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ABSTRACT

This study aims to analyze the scenario of achieving Golden Indonesia 2045 through the perspective of Integrated Reality Theory (IRT)—a framework developed to diagnose the performance of socio-economic systems based on five fundamental variables: Energy (E), Information (I), Entropy (S), Consciousness (C), and Rate of Evolution (v). In contrast to conventional growth approaches that emphasize physical capital accumulation, IRT positions entropy as a divisive variable that determines the effectiveness of all development inputs. Through qualitative analysis with a conceptual-comparative approach, this study finds that Indonesia's success in achieving developed country status by 2045 does not depend on the addition of energy (E) alone, but on the system's ability to suppress bureaucratic entropy—which is manifested in corruption, budget inefficiency, regulatory overlap, and sectoral ego—to close to zero. Without systemic intervention on the entropy variable, the Demographic Bonus and the downstream of natural resources will experience systemic stagnation. These findings imply the need for a shift in policy orientation from economic expansion towards comprehensive structural cleansing, including the establishment of national entropy measurement instruments.

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Introduction

The Golden Indonesia 2045 discourse has become the dominant narrative in national development planning. This vision—which targets Indonesia to get out of the *middle-income trap* and become a developed country in the centenary of independence—is often presented in the framework of linear projections: increase investment, improve infrastructure, optimize the Demographic Bonus. However, after nearly three decades of being trapped in the *middle-income trap*, such a conventional approach has proven insufficient. The data shows an unsettling irony: Indonesia is the world's largest nickel producer with reserves of 55 million tons (US Geological Survey, 2025), controlling nearly 60% of global nickel production by 2024. However, resource abundance is not linearly correlated with well-being. The Audit

Board (BPK) in the Overview of the Results of the Audit Semester II (IHPS) 2024 indicates that there are problems with mining governance that This is where the fundamental problem lies: Indonesia does not lack resources or budget. The biggest challenge lies precisely in the systemic leakage or in Integrated Reality Theory (IRT) terminology, entropy that hinders the effectiveness of development.

The Integrated Reality Theory (IRT) developed by M. Shoim Haris offers a different scalpel. The IRT postulates that the result of collective reality is a function of the interaction of five major variables, which are mathematically formulated as:

$$R_{(T)} = \int_0^T \left[C(v) \cdot f\left(\frac{E \cdot I}{S}\right) \right] dt + \sigma W_T$$

The five variables are defined as follows:

1. Energy (E): The real capacity of the system including natural resources, Demographic Bonus, and physical capital.
2. Information (I): Coordination architecture systems of rules, regulations, standards, integrated data, and technology.
3. Entropy (S): All forms of leakage, friction, and inefficiencies that hinder energy from achieving systemic goals including corruption, convoluted bureaucracy, regulatory overlap, and sectoral egos.
4. Awareness (C): The collective capacity to understand long-term interests over momentary gain.
5. Rate of Evolution (v): The ability of systems to learn, adapt, and improve from historical experience.

The position of entropy (S) as a divisive variable has revolutionary implications: structural leakage cannot be overcome by adding energy—but must be done by decreasing entropy systemically. This research has three main contributions that distinguish it from previous studies on Golden Indonesia 2045. First, this study develops Integrated Reality Theory (IRT) as a macrodevelopment diagnosis framework by placing bureaucratic entropy as a divisive variable that determines the effectiveness of all development inputs. In contrast to conventional institutional approaches that view corruption and inefficiency as residual variables, IRT positions entropy as a central variable that mathematically dominates systemic relationships. Second, this study offers an alternative reading to the Indonesia Emas 2045 scenario that does not depend on optimism for economic growth, but on the system's ability to suppress structural leakage to close to zero. This approach provides a more realistic analytical framework than the linear projections that dominate national development planning. Third, this study proposes the concept of the National Entropy Index (IEN) and the National Entropy Inventory Committee as operational instruments for the evaluation of bureaucratic reform. Both instruments pave the way for measurable and periodic measurements of entropy, transforming systemic diagnosis into implementable policies.

Method

This study uses a qualitative approach with a conceptual-comparative analysis design. Secondary data including World Bank reports, Transparency International, the CPC, and related publications are used illustratively to strengthen theoretical arguments, given that the primary goal of research is the development of an analytical framework (IRT) rather than testing causal hypotheses. This approach is in line with the method used in a preliminary study on the diagnosis of Indonesia's middle-income trap through IRT (M. Shoim & Hwihanus, 2026). The qualitative-conceptual approach allows researchers to conduct systemic readings of Indonesia's development phenomenon through five IRT variables, by placing entropy as a central variable that mediates the effectiveness of all policy inputs. Although quantitative data is used as an illustration, interpretation is carried out within the theoretical framework of the IRT to generate a holistic understanding of ongoing systemic dynamics

Results and Discussion

Energy Variable Analysis (E): Wasted Abundance

Indonesia has two giant energy capitals. First, the Demographic Bonus: about two-thirds of the population will be of productive age by 2045 (BPS, 2022). Second, Downstreaming of Natural Resources: the nickel downstream policy has shown significant results, with the export value of processed nickel products increasing sharply from around 3 billion US dollars in 2019 to tens of billions of US dollars per year (Ministry of Trade, 2024; U.S. Geological Survey, 2025). However, great energy does not automatically lead to great well-being. IRT explains this condition through the relationship between energy and entropy: large amounts of energy lose their effectiveness when the system is filled with structural leaks. The main problem is often not a lack of resources, but rather the system's inability to maintain the value of those resources. In the context of employment, the Demographic Bonus has the potential to be a wasted demographic dividend if it is not supported by a targeted education and training system. The IRT considers that this energy must be converted from mere quantities of raw commodities to value-added energy skilled labor and high-tech industrial products rather than simply being exploited without a clear direction

The information in the IRT acts as a "navigation map" to direct energy. It includes a high-certainty legal system, national data interconnection, and research/technology mastery. Contemporary reality shows that Indonesia has a very large number of central and regional regulations and often overlaps, creating legal uncertainty and high transaction costs for business and investment actors (Ministry of Law and Human Rights, 2023). National technology and research adoption is still lagging behind—the new research budget is 0.28% of GDP (World Bank, 2024), far from the 2% target set in the national planning document. One Data Indonesia is still partial, causing fragmentation of information across sectors. In

the framework of IRT, bad Information (I) magnifies the Entropy (S), not suppresses it. An unintegrated bureaucracy creates "friction" that converts the kinetic energy of development into wasted heat. Entropy in IRT is defined as the loss of a system's ability to convert energy and information into expected outcomes, such as well-being, justice, and stability.

Various problems such as corruption, convoluted bureaucracy, conflicts of interest, overlapping regulations, impunity, monopolies, and corporate crime are not stand-alone problems. Within the framework of IRT, all of these phenomena can be understood as distinct manifestations of entropy i.e., the loss of the system's ability to convert energy and information into expected outcomes. In other words, entropy is not just an incidental "leakage," but a structural feature of the ongoing governance system. To bridge the abstract concept of entropy with measurable measurements, this study proposes the following framework for entropy operationalization:

Table 1. Dimensions and Indicators of Bureaucratic Entropy

Dimension of Entropy	Example of Indicators	Potential Data Sources
Corruption	Corruption Perceptions Index (CPI); the number of corruption cases handled; State losses due to corruption	Transparency International; KPK; CPC
Quality Regulation	Regulatory Quality Index; the number of overlapping rules; Licensing Completion Time	World Bank; Ministry of Law and Human Rights; OSS
Government Effectiveness	Government Effectiveness Index; level of compliance with the Ombudsman's recommendations	World Bank; Ombudsman; Ministry of Finance
Law Enforcement	Rule of Law Index; the level of impunity; Administrative Dispute Resolution	World Justice Project; Supreme Court
Transparency	Open Budget Index; public data disclosure; Access to public information	International Budget Partnership; Kominfo
Budget Efficiency	BPK's findings on expenditure are not on target; <i>Project Cost Overrun</i>	BPK; Bappenas
Public Service	Length of licensing time; community satisfaction index; Service Complaint Rate	Kemenpan-RB; Ombudsman

Based on these dimensions, conceptually a National Entropy Index (IEN) can be constructed with the formula:

$$IEN = \sum_{i=1}^n w_i S_i$$

Where:

- IEN = National Entropy Index
- S_i = entropy score in the i th dimension (0 = minimum/ideal entropy; 1 = maximum/critical entropy)
- w_i = weight of the i -th dimension based on the degree of impact on the effectiveness of the system
- n = total dimensions of entropy measured

This index is designed as a periodic monitoring tool that allows governments and the public to track the progress of entropy reduction over time, as well as compare performance between sectors and between regions.

Structural Entropy: Regulatory Overlap

The overlap of rules and sectoral egos creates friction that turns the kinetic energy of development into wasted heat. In the IRT model, when the entropy doubles, the energy effectiveness is not simply reduced by half, but can collapse disproportionately because a leak at one point allows and masks a leak at another. Every licensing and budgeting process is a "gateway" that takes a toll—financial, time, and opportunity. The investment licensing process in Indonesia is still perceived to be more complex than some competing countries in Southeast Asia (World Bank, 2020). BPK's findings repeatedly show problems of target inaccuracy, non-compliance, and weaknesses of the internal control system in budget management (BPK, 2023; BPK, 2024). At the apparatus level, there is still a dominant mindset that prioritizes "safe procedures" rather than "quick yields." This creates a bureaucratic culture that is resistant to change and innovation. IRT places awareness as the collective capacity to understand long-term interests over momentary gains. In the Indonesian context, Consciousness (C) is faced with a political reality that is often stuck in a short 5-year (electoral) cycle, at the expense of long-term sustainable development.

For decades, Indonesia's natural resource management has been stuck in a short-term extractive orientation: rapid exploitation, raw exports, and rent distribution to certain groups. The shift towards downstream and a one-stop natural resource export policy shows a change in orientation towards strengthening state control and increasing transparency (M. Shoim Haris, 2026b). However, raising awareness does not stop at the level of the political elite. It must be translated into an institutional culture: a transparent bureaucracy, a professional supervisory apparatus, and a strong public accountability system. The question is not only whether the government understands the importance of transparency, but whether the actors

who have benefited from the leaked system are willing to let it shut down. The final variable in IRT is the rate of evolution—the system's ability to learn, adapt, and improve from historical experience. If Indonesia's $\$v\$$ is slower than the pace of world change (AI disruption, multipolar geopolitics, energy transition), then Indonesia will remain trapped in the middle-income trap (Pritchett & Summers, 2014).

Indonesia has shown a gradual learning process. The takeover of the majority of PT Freeport Indonesia's shares in 2018 was the moment when the system began to learn that natural resources should not be completely controlled by foreign parties. The nickel downstream policy in 2020 shows a shift from an extractive economy to a value-added economy. The one-stop natural resource export policy discussed by the Prabowo Subianto government is a further phase of the evolution process. After the state controls raw material exports and encourages downstreaming, the next stage is to strengthen supervision of trade flows and state revenues (M. Shoim Haris, 2026b). Within the framework of IRT, systems with a high evolutionary rate do not wait for a total crisis to change. It detects weaknesses early and makes corrections gradually. However, Indonesia's pace of evolution still faces obstacles: resistance from the old rent group, uneven bureaucratic capacity, and the risk of policy inconsistency due to political dynamics (North, 1990; Acemoglu & Robinson, 2012).

Failure Scenario: If the government continues to add Energy (E) through debt or exploitation of nature, but Entropy (S) in the form of corruption and inefficiency is left high, the system will overheat. A large amount of energy will lose its effectiveness because the system is filled with structural leaks. The result: Indonesia remains trapped as a developing country, with the Demographic Bonus turning into a demographic disaster (mass unemployment) and natural resource wealth continuing to flow out through leakage. **Golden Scenario (Success):** Indonesia has made a big leap if it is able to reduce Entropy (S) near the lowest point, while using technology-based Information (I) and institutional Awareness (C) to manage Energy (E) capital in a sustainable manner. With $\$S \rightarrow 0\$$, the effectiveness of E, I, and C increases exponentially, creating an acceleration towards 2045. This study proposes the establishment of a National Entropy Inventory Committee as a strategic step to measure and map systemic leakage problems in a structured manner. This proposal departs from the fact that so far the government has allocated a large amount of budget for development, bureaucratic reform, corruption eradication, and law enforcement. However, the results obtained are often not as expected—not because of insufficient budget or incompetent human resources, but because systemic leakage has never been systematically mapped (M. Shoim Haris, 2026c).

The committee is designed to be lean and non-permanent, with 5-7 commissioners with the support of 50-100 technical staff and a five-year tenure. The Committee has no repressive powers, only accesses available administrative data, inventories various forms of entropy based on measurable indicators (as formulated in Table 1), and publishes its findings on a regular basis. The cost of establishing the Committee is relatively small—below Rp200 billion per year—much lower than the potential losses due to corruption and inefficiency,

which can reach tens to hundreds of trillions of rupiah every year (M. Shoim Haris, 2026c). The measurement results are then processed into the Sectoral Entropy Index and the National Entropy Index (IEN) published annually, providing tools for the public and policymakers to monitor the progress of entropy reduction on a regular basis. Bureaucratic reform so far tends to be administrative and procedural. The IRT demands a shift towards measurable reforms based on entropy reduction. This means that each bureaucratic unit must be evaluated based on how much they contribute to the decrease in entropy—not just budget absorption or procedural compliance. The echelon performance indicators should be changed from "budget absorbed" to "licensing time cut," "number of overlapping rules removed," and "budget leakage rate lowered." It transforms Consciousness (C) from a slogan into a controlling mechanism. The one-stop natural resource export policy discussed by the government can be understood as an effort to reduce the number of leak points in the mining export chain.

Where previously there were many administrative and logistical lines that were difficult to control simultaneously, then a one-stop system simplifies the supervision architecture to be more concentrated and easy to audit. However, centralization does not automatically remove entropy. It only moves the locus of surveillance. Without independent oversight, a single point of control can turn into a new rent center—a phenomenon referred to in the IRT as secondary entropy, that is, leakage that arises not because of a weak system, but because an excessive concentration of authority creates new loopholes for the abuse of power. Therefore, digitalization must be accompanied by public transparency and strong audit mechanisms. This research is conceptual and theoretical, so no empirical testing has been conducted on the relationship between IRT variables. Although secondary data are used as illustrations, this study does not construct an econometric model to test the statistical validity of the proposed concept of entropy. Therefore, the generalization of these findings is still limited to the conceptual realm and requires further validation through empirical research. Further research needs to develop econometric models or composite indices to test the empirical validity of the concept of entropy in various development sectors, such as education, health, infrastructure, and natural resource governance. In addition, cross-country comparative studies can be conducted to test whether the entropy variable does indeed have a dominant influence on development effectiveness as predicted by the IRT.

Conclusion

This study analyzes the Golden Indonesia 2045 scenario through the lens of Integrated Reality Theory (IRT) and finds that the success of the leap towards a developed country is not a matter of increasing physical capital alone, but a process of aligning five macro variables so that the state system does not experience systemic stagnation. Bureaucratic entropy is a critical variable that determines the effectiveness of all development inputs. As long as the S remains high, Indonesia will not reach the take-off point, no matter how much E and I are added. The three points of entropy singularity—

structural (regulatory overlap), transactional (bureaucracy as a toll gate), and cultural (procedural mentality) must be radically suppressed through measurable reforms. The operationalization of entropy through the National Entropy Index (IEN) and the establishment of the National Entropy Inventory Committee are strategic instruments to measure, map, and publish systemic leaks on a regular basis, creating a continuous repair cycle. Digitization and data integration should be designed not just for efficiency, but to reduce the number of leak points and create public transparency, with caution against the risk of secondary entropy due to excessive centralization. IRT teaches that progress is not destiny, but the result of systemic mathematical calculations. Indonesia has all the capital—abundant energy, information that is starting to improve, and Consciousness that is growing. However, all of that would be in vain if the bureaucratic entropy was not radically suppressed.

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