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Multi-Level Data Interoperability for One Data Indonesia: A Coordinative Governance Study

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Abstract: This study discusses the interoperability of multi-level data in the framework of implementing the One Data Indonesia policy. This research intends to solve the problem of the fragmented data of the public sector across ministries, agencies, provinces and regencies/cities which affects the quality of evidence-based policymaking. This study uses a qualitative descriptive method in analyzing policy documents, official achievement data from the One Data Indonesia Portal, and statistics data from Statistics Indonesia related to ICT development and digital readiness. The results indicate that One Data Indonesia has achieved substantial progress with 453,865 datasets in the national portal, 70 of 98 ministries/agencies, 31 of 38 provinces, and 273 of 514 regencies/cities taking part. However, the low participation of regencies/cities indicates the still-existing gap in multi-level governance. The study also found that with the increase in digital readiness, as seen in the increase of Indonesia's ICT Development Index from 5.90 in 2023 to 6.02 in 2024, it does not automatically guarantee interoperability. The study concludes that data interoperability requires regulatory alignment, institutional coordination, metadata discipline, technical integration and policy-oriented data use.

INTRODUCTION

Digital transformation has emerged as a critical focus in modern public administration, with governments increasingly required to develop policies grounded in precise, cohesive, and prompt data. In the realm of digital governance, data is regarded not just as administrative documentation but as vital public resources that influence the effectiveness of policy formulation, execution, oversight, assessment, and civic responsibility. Thus, the ability of governmental entities to administer, share, and leverage data proficiently has emerged as a progressively vital aspect of contemporary governance capability (Najem, 2025; Yan & Kostka, 2026; Zhanbayev et al., 2026).

In Indonesia, this agenda has been institutionalized through the One Data Indonesia policy, which seeks to produce government data that are accurate, up to date, integrated, accountable, accessible, and shareable across central and regional government institutions (Dunham, 2025; Pariyar, 2026; Rodríguez et al., 2024; Ross et al., 2022). Presidential Regulation Number 39 of 2019 establishes four core principles of One Data Indonesia: data standards, metadata, data interoperability, and reference codes or master data. These principles indicate that One Data Indonesia is not merely a data-publication initiative but a broader governance framework requiring coordination among ministries, agencies, provinces, regencies, and cities.

The need for such a framework arises from persistent fragmentation in Indonesia's public-sector data management. Government institutions often produce and manage data independently according to different definitions, classifications, formats, and updating procedures. These differences contribute to duplication, weak comparability, inconsistent policy evidence, and difficulties in integrating information across institutions. Such fragmentation can ultimately affect the quality and timeliness of policy planning, particularly in policy areas that depend on coordination among multiple government agencies and levels of government.

This fragmentation demonstrates that the principal challenge is not solely technological. Public-sector data are produced within complex institutional environments characterized by

different legal mandates, administrative routines, technological capacities, and policy priorities. Effective data governance therefore requires not only appropriate digital infrastructure but also clear institutional responsibilities, shared standards, coordination mechanisms, data-quality management, and sustained commitment among government actors (Beidollahkhani, 2025; Kollar, 2026; van Holstein et al., 2023; Vozab, 2023; Yokoyama, 2023).

In this framework, interoperability serves as the essential connection between disjointed data generation and cohesive policy application. Interoperability denotes the ability of systems, organizations, and data frameworks to communicate, comprehend, and employ information efficiently. It includes technical, semantic, organizational, and legal aspects. For One Data Indonesia, this signifies that governmental data should not only be accessible but also comparable, machine-readable, semantically coherent, institutionally reliable, and able to be exchanged across organizational limits. Interoperability serves as a conduit linking data accessibility to evidence-driven policy formulation.

The difficulty intensifies in Indonesia due to its decentralized governmental structure. Data are generated and utilized by entities functioning at several administrative tiers, encompassing ministries, national agencies, provincial administrations, and local/regional governments. Consequently, the execution of One Data Indonesia relies not solely on national regulatory guidance but also on the ability of subnational authorities to embrace common standards, uphold metadata integrity, establish technical infrastructures, and engage in intergovernmental collaboration. From this viewpoint, data interoperability ought to be perceived as a multi-tiered governance issue rather than merely a technical integration concern.

Recent execution data exemplify this difficulty. By the year 2025, the One Data Indonesia Portal housed 453,865 datasets and engaged 70 out of 98 ministries/agencies, 31 out of 38 provinces, and 273 out of 514 regencies/cities (Kementerian PPN/Bappenas, 2025). Despite the considerable engagement at both federal and provincial tiers, involvement at the regency/city level is markedly diminished. This disparity is especially significant as numerous datasets pertinent to policy such as those concerning poverty, health, education, social aid, local economies, and public services are produced at the local level. When local data lack enough standardization or interoperability, their incorporation into national policy frameworks becomes increasingly challenging.

Simultaneously, advancements in digital preparedness do not inherently address these governance issues. Indonesia's ICT Development Index rose from 5.90 in 2023 to 6.02 in 2024, alongside enhanced internet accessibility. Nevertheless, enhancements in infrastructure and connectivity do not inherently result in institutional interoperability. Digital preparedness should be complemented by organizational preparation, uniform metadata practices, data-sharing frameworks, regulatory coherence, and collaborative capability among governmental entities (Rayón-Rumayor et al., 2024; Suter et al., 2024).

Notwithstanding the increasing focus on digital governance, open government data, digital preparedness, and public-sector interoperability, a significant analytical void persists in comprehending the interactions of these facets across various governmental tiers within Indonesia's decentralized administrative framework. Current dialogs often treat technical integration, regulatory frameworks, data standards, and digital capabilities as isolated topics, neglecting the interconnectedness of these elements with cross-level institutional coordination within a cohesive governance structure. This disparity is significant as the efficacy of One Data Indonesia relies not solely on the presence of technical standards or a national data portal, but on the ability of various governmental institutions to collaborate, adhere to common standards, and convert integrated data into practical policy applications.

Notwithstanding the increasing focus on digital governance, open government data, digital preparedness, and public-sector interoperability, a significant analytical void persists in comprehending the interactions of these facets across various governmental tiers within Indonesia's decentralized administrative framework.

The originality of this research resides in framing interoperability not solely as a technical attribute of information systems, but as a governance process that encompasses regulatory

alignment, institutional coordination, metadata management, technical integration, and policy application. Drawing from these parameters, the research formulates a Multi-Level Interoperability Governance Model that elucidates the enhancement of data interoperability across several governmental tiers. Theoretically, the research enhances the body of knowledge on digital governance, data governance, and multi-tiered governance by amalgamating technological and institutional aspects under a unified governance framework. Essentially, it offers policy recommendations for bolstering local government capabilities, augmenting adherence to metadata and data standards, refining inter-level coordination, and guaranteeing that integrated data are proficiently incorporated into planning, budgeting, monitoring, and evaluation frameworks.

RESEARCH METHODS

This research utilized a qualitative descriptive methodology through the analysis of policy documents and the interpretation of secondary data. The concept was chosen to investigate how regulatory frameworks, institutional involvement, digital preparedness, and intergovernmental cooperation influence the execution of data interoperability within the One Data Indonesia initiative.

The materials and datasets were intentionally chosen according to four specific criteria. Initially, the sources needed to be explicitly connected to the execution, governance, or efficacy of One Data Indonesia. Secondly, the sources must originate from official governmental entities or include corroborated policy and statistical data. Third, the documents were required to furnish information pertinent to at least one of the analytical dimensions scrutinized in this research, specifically regulation, institutional involvement, interoperability, metadata and data standards, or digital preparedness. Fourth, the sources needed to be pertinent to the timeframe associated with the execution and current advancements of One Data Indonesia. Consequently, the examination encompassed the timeframe from the promulgation of Presidential Regulation Number 39 of 2019 to the latest execution and statistical information accessible until 2025.

The primary documentary references included Presidential Regulation Number 39 of 2019 regarding One Data Indonesia, official implementation data from the One Data Indonesia Portal and the Ministry of National Development Planning/Bappenas, as well as statistical publications from Statistics Indonesia (BPS), notably the ICT Development Index and telecommunications statistics. Scholarly literature served as a supplementary resource to enhance the analysis of the empirical and policy results.

The focus of analysis was the governance framework for multi-tiered data interoperability in the execution of One Data Indonesia. The examination concentrated on four specific dimensions: (1) the regulatory structure overseeing data standards, metadata, interoperability, and reference codes or master data; (2) institutional involvement among ministries/agencies, provinces, and regencies/cities; (3) indicators of digital preparedness that could influence data integration; and (4) coordination frameworks connecting data generation, standardization, exchange, and policy application across governmental tiers.

The examination of the policy document was carried out in four phases. Initially, the pertinent documents and datasets were recognized and evaluated according to the aforementioned selection criteria. Secondly, data from the chosen sources was gathered and structured in accordance with the analytical facets of regulation, institutional involvement, digital preparedness, interoperability criteria, and policy application. Third, the data were systematically analyzed across several governmental tiers to discern patterns, deficiencies, and disparities in institutional engagement and execution capability. Specific focus was directed at the disparities among ministries/agencies, provinces, and regencies/cities. Fourth, the results were analyzed by associating regulatory frameworks, participation metrics, and digital preparedness indicators with the principles of multi-tiered governance and collaborative governance. The amalgamation of these results was later employed to build the Multi-Level Interoperability Governance Model.

To enhance analytical coherence, the research utilized source triangulation by contrasting regulation papers, official implementation data, and national statistical sources. This

methodology was employed to ascertain if patterns detected in a single source aligned with corroborative information from additional authoritative sources. The examination was interpretive and focused on policy, without attempting to determine statistical causation. The objective was to elucidate the interplay of regulatory design, institutional involvement, digital preparedness, and cross-tier coordination in influencing the execution of data interoperability within Indonesia's multi-tiered governance framework.

RESULTS AND DISCUSSION

One Data Indonesia Regulatory Foundations

One Data Indonesia was founded pursuant to Presidential Regulation Number 39 of 2019, which delineates the national policy framework for the regulation of government data. The rule mandates that data generated by governmental entities adhere to universal data standards, incorporate standardized metadata, fulfilll interoperability criteria, and utilize reference codes or master data (Pemerintah Republik Indonesia, 2019). These four concepts are not autonomous technical stipulations. Instead, they function as interrelated governance systems that facilitate the consistent interpretation, exchange across institutional borders, and integration of data generated by various ministries, agencies, provinces, and municipalities into unified policy frameworks.

Table 1. ~~Core Principles of One Data Indonesia (ODA)~~ Core Principles of One Data Indonesia and Their Role in Interoperability

Principle	Meaning	Relevance to Interoperability	Concrete Mechanism Across Agencies and Government Levels
Data standards	Data must follow agreed standards regarding concepts, definitions, classifications, measurement units, and methodologies.	Reduces differences in definitions and measurement across institutions.	Enables ministries, agencies, and subnational governments to produce comparable datasets using common definitions and measurement rules, thereby reducing conflicting indicators for the same policy issue.
Metadata	Data must be accompanied by standardized explanatory information describing their definition, source, methodology, period, and other relevant characteristics.	Improves traceability, interpretation, and institutional understanding of datasets.	Allows data produced by one institution or level of government to be understood and reused by others because users can identify the origin, methodology, coverage, and meaning of the data.
Interoperability	Data must be consistent in syntax, structure, and semantics and stored in formats that enable electronic exchange.	Enables systems and institutions to exchange and process data across organizational boundaries.	Supports technical and semantic exchange among ministerial, agency, provincial, and regency/city information systems, allowing datasets to be transferred, combined, and processed without extensive manual restructuring.
Reference codes / master data	Data must use agreed reference codes and master data for key objects and entities.	Prevents duplication and inconsistent identification across datasets.	Provides common identifiers for administrative areas, institutions, population groups, or other policy objects so that datasets produced by different institutions can be linked and reconciled accurately.

Source: Processed by the author from Presidential Regulation Number 39 Year 2019

Table 1 illustrates that the four principles of One Data Indonesia operate as a cohesive interoperability framework instead of distinct administrative mandates. Data standards establish a uniform foundation for generating comparable information among entities. In the absence of shared definitions, classifications, and measurement protocols, datasets pertaining to the same

policy issue may convey disparate meanings or values, thereby hindering their amalgamation. In this regard, standardization pertains to interoperability for data generation.

Metadata functions at the realm of comprehension and accountability. Although datasets may employ analogous formats, their reliable sharing or reuse is contingent upon other institutions comprehending the data production process, the demographic or geographic scope, the methodologies utilized, and the timing of data updates. Standardized metadata thereby diminishes uncertainty between data creators and data consumers across ministries, agencies, provinces, and municipalities.

Interoperability offers the technological and semantic framework that enables standardized datasets to transfer between institutional systems. Adherence to standard syntax, structure, semantics, and open formats diminishes the necessity for redundant manual conversions and promotes the integration of datasets from various governmental entities. Nonetheless, mere technological communication is inadequate when the data pertains to identical entities represented by disparate identifiers.

Consequently, reference codes and master data offer an extra means of maintaining uniformity across several levels of government. Common reference codes enable various organizations to uniformly recognize identical administrative areas, organizational divisions, demographic classifications, or other policy entities. This function holds significant importance under Indonesia's multi-tiered governance framework, where analogous data can be produced autonomously by central ministries, provincial administrations, and regency/city authorities.

Collectively, these principles create a framework for interoperability: data standards dictate the production of data; metadata elucidates the interpretation of data; interoperability criteria facilitate their technical and semantic interchange; and reference codes/master data guaranty consistent identification and linkage of entities across various datasets. Their efficacy is hence reliant on synchronized execution across institutional and governmental divides.

Consequently, One Data Indonesia must not to be perceived solely as a national data repository. It signifies a governance framework intended to orchestrate the production, description, identification, interchange, and eventual utilization of government data among organizations. Presidential Regulation Number 39 of 2019 designates responsibilities to data supervisors, data custodians, data producers, and the One Data Indonesia Forum. These institutional entities are crucial as the four principles of interoperability do not function autonomously; they necessitate coordination, adherence, validation, and ongoing alignment among governmental bodies.

Involvement of Institutions in One Data Indonesia

One Data Indonesia has made great progress on implementation. In 2025, One Data Indonesia Portal has 453,865 datasets. Institutional participation consisted of 70 of 98 ministries/agencies, 31 of 38 provinces, and 273 of 514 regencies/cities. In addition, there were 3,291 priority datasets from 98 ministries/agencies established as part of the Medium-Term Development Data Master Plan (2025–2029) (Kementerian PPN/Bappenas, 2025).

Table 2. Implementation Achievement of One Data Indonesia 2025

Indicator	Achievement	Percentage	Governance Meaning
Datasets available in the SDI Portal	453,865 datasets	-	Indicates increasing data publication
Ministries/agencies participating	70 of 98	72%	Shows relatively strong central participation
Provinces participating	31 of 38	71%	Shows relatively strong provincial participation
Regencies/cities participating	273 of 514	53%	Shows a local-level participation gap
Priority data 2025–2029	3,291 datasets from 98 ministries/agencies	100% K/L	Shows alignment with national development planning

Source: Processed by the author from the One Data Indonesia Portal, 2025

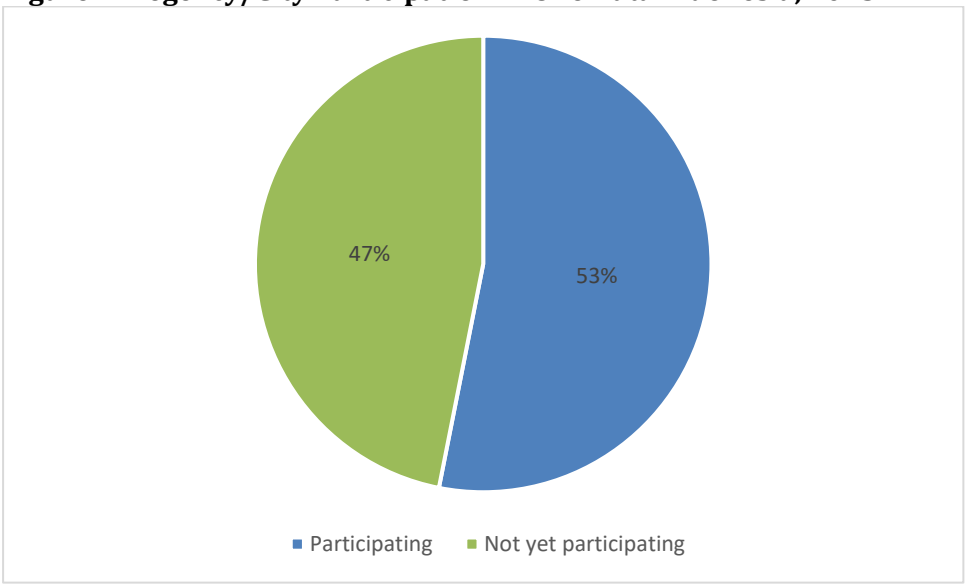
Data reveals that the participation at central and provincial levels has crossed 70 percent. However, participation of regencies/cities is still at 53 percent. This finding indicates that the main challenge of One Data Indonesia is not only at the national level in terms of coordination, but also in terms of vertical coordination between the central and local governments (Kementerian PPN/Bappenas, 2025).

The regency/city level participation gap is important because a lot of data that are relevant to policy are produced locally. Local government institutions generally provide information on poverty, health, education, infrastructure, population, social assistance, local economy and public services. If local data are not interoperable with national systems, national policymaking can be incomplete or delayed. This confirms that interoperability is to be considered a multi-level governance issue rather than a technical data management issue.

The Regency/City Engagement Gap

The weakest link of the institutional participation structure is the regency/city level. Until 2025, only 273 of 514 regencies/cities have participated in the implementation of One Data Indonesia, while 241 have not yet participated (Kementerian PPN/Bappenas, 2025).

Figure 2. Regency/City Participation in One Data Indonesia, 2025



Source: Processed by the author, One Data Indonesia Portal, 2025.

This is an example of a multi-level interoperability gap. Even though the central ministries and provinces have relatively strong participation, the absence of almost half of regencies/cities' participation can weaken data completeness. Public policy data gaps at the local level can result in poor targeting, delayed planning and limited monitoring.

The regency/city gap may be due to several factors. First, the digital infrastructure of local governments varies. Second, there is uneven human resource capacity for data management. Third, institutional arrangements for data custodians and producers are not strong in all local governments. Fourth, some local governments may still regard data as sectoral administrative property rather than shared public governance property. These barriers correspond to the open data literature which identifies institutional resistance, limited capacity and poor data quality as major barriers to effective data reuse (Dzhavad & Ivleva, 2025; Elbourkhissi & Houssaini, 2025; Scaramuzzino et al., 2024).

Digital Preparedness and ICT Development

Digital readiness is essential for data interoperability. The lack of adequate ICT infrastructure and internet connectivity is an obstacle to data exchange between institutions. BPS data shows that Indonesia's ICT Development Index rose from 5.90 in 2023 to 6.02 in 2024. The index measures the development of ICT, digital divide, and regional ICT development potential(Nggilu et al., 2025; Olagunju, 2026; O'Rourke, 2025), BPS said.

Table 3. ICT Development Index and Internet Access Indicators

Indicator	2023	2024	Interpretation
ICT Development Index	5.90	6.02	Indicates improving ICT readiness
Population accessing the internet	69.21%	72.78%	Indicates increasing digital access
Population owning mobile phones	-	68.65%	Indicates mobile-based connectivity potential
Households owning fixed-line telephones	1.17%	0.99%	Indicates declining relevance of fixed-line infrastructure
Households owning computers	18.06%	18.52%	Indicates limited but slightly increasing computer ownership

Source: Processed by the author from BPS 2023, BPS 2024, and Statistics of Telecommunication Indonesia 2024.

The data indicates that Indonesia's digital readiness is improving. The growth of internet access and ICT Development Index provides a good environment for digital data governance. But the data also show access is not universal. Computer ownership is still low, and the mobile phone remains the primary means of digital access. This means that interoperability strategies cannot assume equal institutional capacity in all regions (Zhanbayev et al., 2026)

From Data Availability to Interoperability

The explosion of datasets in the One Data Indonesia Portal demonstrates a notable progress in data publication. However, mere availability of data does not automatically guarantee interoperability. Consistency in metadata, structure, semantics and reference codes are required for interoperability (Enock et al., 2026).

Table 4. From Data Availability to Data Interoperability

Stage	Main indicator	Main challenge
Data availability	Number of datasets uploaded	Quantity does not guarantee quality
Data standardization	Use of agreed definitions and indicators	Sectoral differences in definitions
Metadata quality	Availability of complete metadata	Inconsistent metadata practices
Technical interoperability	Machine-readable and open formats	System incompatibility across agencies
Semantic interoperability	Shared meaning and classification	Different interpretation of indicators
Policy utilization	Data used in planning and evaluation	Data not fully embedded in policy cycle

Source: Author's analysis based on principles of One Data Indonesia.

This table illustrates the gradual transition from data availability to data interoperability. Hundreds of thousands of datasets could be available in a portal, but without standardized, machine-readable and semantically consistent data, they may not be useful for integrated policymaking. This result substantiates the statement that open government data not only needs to be published, but also needs to be of high quality, usable and supported by institutions to allow reuse (Pariyar, 2026; Parwez & Khan, 2026; Sahrawat et al., 2026).

Multi-layer Interoperability Issues

The research delineates five interrelated types of fragmentation that hinder multi-tiered data interoperability in the execution of One Data Indonesia: institutional, standard, technological, capacity, and utilization fragmentation. These types of fragmentation do not function autonomously. Conversely, they bolster each other across various phases of data generation, dissemination, and policy implementation.

Initially, institutional fragmentation arises as ministries, agencies, provinces, and municipalities handle data based on varying legal directives, organizational practices, and sector-

specific obligations. This influences the methods of data collection, updating, validation, and dissemination. The disparity in involvement at the regency/city level serves as a tangible manifestation of this issue. Although federal and provincial involvement in One Data Indonesia has surpassed 70 percent, merely 273 out of 514 regencies and cities, equating to around 53 percent, were engaged by 2025. This suggests that vertical coordination is inconsistent among various governmental tiers.

Secondly, standard fragmentation arises when organizations employ varying definitions, classifications, indicators, metadata frameworks, or measurement methodologies for analogous policy entities. Such discrepancies diminish the comparability of datasets, even when the data is technically accessible. For instance, information regarding social welfare, rural infrastructure, micro, small, and medium enterprises, demographics, or public services could be generated utilizing several sectoral definitions. Institutional fragmentation can exacerbate standard fragmentation, as agencies with varying mandates may persist in utilizing their own administrative classifications unless unified standards are deliberately coordinated and enforced.

Thirdly, technical fragmentation occurs when governmental information systems lack efficient data sharing capabilities. Diverse data formats, proprietary databases, incompatible software applications, and restricted application programming interface (API) integration can hinder data transfer between systems. Nonetheless, the findings of this research suggest that technical fragmentation must be considered in conjunction with institutional and capability elements. Despite the rise of Indonesia's ICT Development Index from 5.90 in 2023 to 6.02 in 2024, enhanced digital preparedness has not inherently resolved interoperability discrepancies. This indicates that the provision of digital infrastructure is inadequate when institutional frameworks, uniform standards, and organizational capabilities are inconsistent.

Fourth, capacity fragmentation denotes disparities in human resources, institutional proficiency, digital infrastructure, and data-management skills among governmental entities, especially at the subnational tier. The diminished involvement of regencies/cities relative to ministries/agencies and provinces suggests that interoperability capabilities are inequitably allocated among governmental tiers. Restricted capacity can exacerbate technological and standard fragmentation, as local authorities with diminished technical and human-resource competencies may encounter heightened challenges in implementing national metadata standards, sustaining interoperable systems, or continuously updating information.

Fifth, usage fragmentation transpires when data is disseminated yet fails to be properly integrated into planning, budgeting, monitoring, evaluation, and other decision-making frameworks. This signifies the ultimate phase of the interoperability issue. Even when datasets are accessible and technically transferable, their governance significance is constrained if organizations fail to incorporate them into policy frameworks. Consequently, usage fragmentation might be perceived as a cumulative result of persistent institutional, standard, technological, and capacity fragmentation.

The interplay among these five types of fragmentation indicates that interoperability functions as a governance continuum. Institutional fragmentation may lead to disparate standards; disparate standards can hinder technical integration; restricted organizational and human-resource capabilities may limit adherence to both technical and metadata stipulations; and these cumulative deficiencies can ultimately obstruct the effective utilization of available data in policymaking. Consequently, a setback at one phase can create or exacerbate vulnerabilities in later phases.

Table 5. Interactions Among Multi-Level Data Interoperability Fragmentation

Fragmentation Type	Empirical Indication	Interaction with Other Fragmentations	Policy Risk
Institutional fragmentation	Uneven participation across levels of government; only 273 of 514 regencies/cities participated in One Data Indonesia by 2025	Different mandates and routines can produce inconsistent standards and weak coordination	Duplication, fragmented data governance, and weak vertical coordination

Standard fragmentation	Differences in indicators, classifications, metadata, and definitions across institutions	Reinforced by institutional autonomy and complicates semantic and technical integration	Inconsistent and non-comparable policy evidence
Technological fragmentation	Different formats, closed databases, incompatible systems, and limited API integration	Infrastructure alone cannot overcome weak standards, coordination, or institutional capacity	Limited automated data exchange and system integration
Capacity fragmentation	Uneven digital and organizational readiness, particularly among regencies/cities	Weak capacity limits adoption of metadata standards, system integration, and regular data updating	Local data gaps and uneven implementation
Utilization fragmentation	Data availability does not automatically translate into systematic policy use	Accumulates the effects of institutional, standard, technological, and capacity weaknesses	Weak evidence-based planning, budgeting, monitoring, and evaluation

Source: Author's analysis based on policy document review, One Data Indonesia implementation data, and secondary statistical data.

The evidence presented in Table 5 indicates that multi-level interoperability problems should not be interpreted as isolated technical deficiencies. Instead, they operate as a cumulative governance process. For example, the relatively low participation of regencies/cities is not only an institutional participation problem. It can also indicate differences in administrative capacity, technical readiness, and the ability to comply with national data and metadata standards. Similarly, improvements in national ICT indicators do not automatically produce interoperability if institutional actors continue to use incompatible standards or if local governments lack sufficient organizational capacity to integrate their systems (Nardelli & Santaella-Goncalves, 2026; Olagunju, 2026).

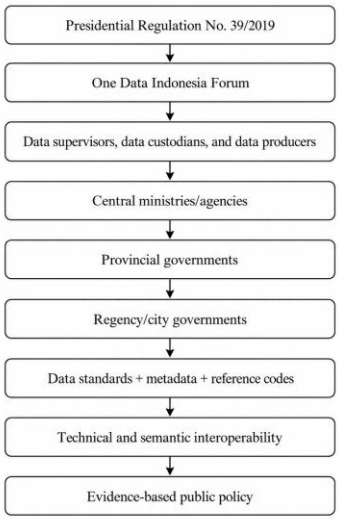
This interaction explains why increasing the number of datasets or expanding digital infrastructure alone is unlikely to resolve interoperability problems. Institutional coordination, standard compliance, technical integration, local government capacity, and policy utilization must develop simultaneously. The five forms of fragmentation therefore represent interconnected dimensions of the same governance problem rather than separate implementation barriers.

From a collaborative governance perspective, addressing these interconnected problems requires shared understanding, institutional commitment, facilitative leadership, and sustained coordination among data supervisors, data custodians, data producers, and the One Data Indonesia Forum. These institutional mechanisms are essential for translating formal interoperability principles into coordinated operational practices across ministries, agencies, provinces, and regencies/cities.

Multi-Level Interoperability Governance Model

Based on the findings, this study proposes a Multi-Level Interoperability Governance Model. The model places One Data Indonesia as a governance architecture that links policy regulations, institutional actors, standards, infrastructure, and utilization.

Figure 3. A multi-level model for interoperability governance



Source: Author's model based on One Data Indonesia principles and secondary data analysis.

The model demonstrates that interoperability needs to work across levels. Legal basis is determined at the level of regulation, namely Presidential Regulation Number 39 of 2019. At the institutional level, actors are coordinated by One Data Indonesia Forum. Data supervisors, custodians and producers, at the operational level, ensure that data are compliant with the standards. At the technological level, systems must be able to support data exchange. Data should be used for planning, monitoring and evaluation at the policy level"

The results show that One Data Indonesia has achieved a lot of progress in terms of data publication and institutional participation. But the critical policy problem is shifting from data availability to data interoperability. The number of 453,865 datasets is remarkable, but the quality of data governance lies in the extent to which these datasets are standardized, machine-readable, semantically consistent, and usable across institutions (Kementerian PPN/Bappenas, 2025).

The participation gap at the regency/city level is of particular importance. Local governments are at the heart of data production in decentralized governance systems. If almost half of the regencies/cities are not yet fully involved, the national data ecosystem will not be complete. This can have implications for policy sectors such as social assistance, disaster management, health, education, village development and local economic planning.

Data BPS pengembangan ICT dan akses internet menunjukkan bahwa lingkungan digital Indonesia semakin baik. But more internet access doesn't necessarily mean interoperability problems go away. Interoperability is not just connectivity. It further addresses institutional agreements, data standards, metadata discipline, legal clarity, cybersecurity, and data literacy for public officials (Badan Pusat Statistik, 2025).

This study therefore advocates for strengthening One Data Indonesia through three strategies. First, the government should focus on building the capacity of local government, especially at the regency/city level. Second, monitoring of data standards and metadata compliance should be more systematic. Third, interoperability should be linked directly to policy use so that data integration is embedded in planning, budgeting, monitoring and evaluation.

CONCLUSSION

The results of this study concluded that multi-level data interoperability is an important determinant in supporting the implementation of the One Data Indonesia policy. One Data Indonesia has established a significant regulatory and institutional foundation to improve national data governance, through data standards, metadata, interoperability principles, and reference codes or master data. However, these principles are applied differently at different levels of government. The results show that One Data Indonesia has shown significant improvement in data publication and institutional participation. The availability of 453,865 datasets in the One Data Indonesia Portal is evidence that the publication of government data has increased significantly. In addition, 70 of 98 ministries/agencies and 31 of 38 provinces also exhibit relatively high participation at the central and provincial levels. But the participation of only 273 regencies/cities out of 514 regencies/cities shows a big gap at the local level. This gap is important, because a lot of data relevant to policy-making is produced at the local level, including data on poverty, health, education, public services, social assistance, infrastructure, and local economic development.

The study also finds that digital readiness is not sufficient for data interoperability. Although the ICT Development Index of Indonesia has increased from 5.90 in 2023 to 6.02 in 2024, and internet access continues to increase, interoperability still depends on institutional readiness, quality of metadata, shared data standards, legal clarity, technical integration, and coordination capacity among government actors. In other words, interoperability is not just a technological problem but a governance process that involves coordination among institutions and levels of government. These findings point to three practical strategies that the study recommends. First, the government should strengthen the capacity of the regency/city governments as the main data producers in the national data ecosystem. Secondly, compliance monitoring with data standards, metadata and reference codes should be more systematic. Third, interoperability should be directly linked to policy planning, budgeting, monitoring and evaluation so that data integration does not end with data publication, but feeds into evidence-based public policy-making. The proposed multi-level interoperability governance model highlights that the success of One Data Indonesia should not be measured only on the number of datasets uploaded, but also on the degree of standardization, connection, trust, and utilization of data in public policy.

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