



An Institutional Analysis of Indigenous Data Governance Within Indonesia's STI Policy System

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ABSTRACT

This study examines the institutional positioning of Indigenous Data Governance (IDG) within Indonesia's Science, Technology, and Innovation (STI) policy system. Using qualitative analysis of key policy documents, such as Law No. 11/2019 on the National System of Science and Technology, Law No. 27/2022 on Personal Data Protection, and Law No. 6/2014 on Villages, this study investigates how IDG principles in Indonesia are reflected within policies governing data, knowledge, and innovation. The analysis was guided by the institutional perspective encompassing regulative, normative, and cultural-cognitive dimensions. The findings indicate that IDG remains institutionally peripheral within Indonesia's STI policy system. While several regulations provide a foundation for data protection and governance, they do not explicitly recognize Indigenous collective data rights. Recognition of Indigenous authority and knowledge systems also remains limited. In practice, STI policies still largely favor individual- and state-centered approaches, while core IDG principles, such as data sovereignty and community control, receive insufficient support. These drawbacks are reflected in the limited inclusion of Indigenous actors, weak institutional coordination, and the lack of mechanisms supporting IDG implementation. This study highlights the need for stronger institutional alignment, governance coherence, and recognition of Indigenous rights within Indonesia's STI policy system.

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I. INTRODUCTION

In recent decades, Science, Technology, and Innovation (STI) policy systems have increasingly relied on data-driven governance mechanisms to strengthen research productivity, facilitate knowledge exchange across institutions, and support evidence-based policymaking (OECD, 2015). As governments expand national research infrastructures and digital governance systems, data have become a strategic resource shaping innovation capacity and national development agendas. Integrated data systems, while can improve the effectiveness of research coordination and policy implementation, also raise governance challenges regarding the management and use of knowledge resources. This challenge is increasingly relevant in the context of Indonesia, where recent STI reforms have strengthened the integration and centralization of research governance. The establishment of the National Research and Innovation Agency (BRIN) has accelerated the centralization of STI governance and strengthened the integration of national research activities (Putera et al., 2022). However, as research involving Indigenous peoples and local knowledge systems increases, questions arise about who possess authority over data related to Indigenous peoples, how such data should be governed, and to what extent Indigenous peoples can participate in decisions regarding the collection, use, and sharing of information derived from their knowledge systems and territories.

In Indonesia, strengthening data-driven STI governance has become an important component of national development strategies. Law No. 11/2019 on the National System of Science and Technology emphasizes research data integration and management to strengthen national innovation performance. This agenda was further institutionalized through the establishment of BRIN in 2021, which consolidated research institutions previously distributed across ministries into a centralized governance structure intended to improve coordination, strengthen innovation capacity, and support Indonesia Vision 2045. Operationally, BRIN Regulation No. 6/2023 established a national framework governing research data collection, storage, integration, standardization, and utilization within Indonesia's national research ecosystem. These developments reflect Indonesia's transition toward increasingly integrated and centralized STI governance arrangements.

However, the expansion of integrated research data governance also creates institutional

challenges, particularly when research activities involve culturally sensitive knowledge and Indigenous communities. International discussions, such as the ones facilitated by the World Intellectual Property Organization (WIPO), increasingly emphasize that traditional knowledge and cultural heritage cannot be governed solely through conventional data management approaches without considering collective rights and community interests. As research activities increasingly document local knowledge systems, cultural practices, and community resources, questions emerge regarding authority over Indigenous-related data, ownership arrangements, ethical governance mechanisms, and institutional responsibilities. These concerns become increasingly relevant as data-intensive research and innovation activities continue expanding within Indigenous territories and local knowledge environments (WIPO, 2022).

Indonesia poses a particularly significant case in this discussion due to its simultaneous pursuit of centralized STI transformation and extensive Indigenous diversity. As one of the world's largest archipelagic countries with hundreds of Indigenous communities and increasingly centralized state-led digital governance initiatives, Indonesia provides a unique institutional setting where tensions among national STI ambitions, data governance centralization, and collective Indigenous rights have been increasingly visible. Although the country's law recognizes Indigenous communities and traditional rights, expansion of integrated national data infrastructures increasingly intersects with decentralized governance arrangements and community-based knowledge systems. This institutional configuration provides opportunities to examine how tensions between centralized innovation governance and collective Indigenous rights shape governance coherence within emerging STI policy system. Examining Indonesia's case, therefore, contributes to not only national policy discussions, but also broader debates concerning Indigenous Data Governance (IDG) implementation within emerging innovation systems.

In response to these challenges, IDG has emerged as a framework affirming Indigenous peoples' rights to control the collection, ownership, access, and use of data related to their communities, territories, knowledge systems, and resources. IDG was developed based on the Indigenous Data Sovereignty principles, which emphasize collective authority over indigenous-related information and decision-making processes concerning how data are collected, managed,

stored, and utilized within research and policy systems (Kukutai & Taylor, 2016; Carroll et al., 2020). Through pertinent principles, such as CARE (Collective Benefit, Authority to Control, Responsibility, and Ethics), IDG emphasizes that governance arrangements should respect Indigenous authority, ethical obligations, and cultural values. Within research and innovation systems, IDG extends beyond data protection concerns and addresses several broader issues, such as power relations in knowledge production, legitimacy of research processes, as well as relationships among Indigenous communities, state institutions, and research organizations. Beyond regulatory alignment, IDG also raises deeper institutional questions concerning authority over knowledge infrastructures, legitimacy of data ownership, as well as power asymmetries between centralized STI governance systems and community-based knowledge sovereignty (Carroll et al., 2019). Within STI policy system, governance arrangements not only shape technological development, but also determine which types of knowledge are considered decent to be recognized, protected, and incorporated into national innovation ecosystem. Consequently, tensions between centralized data governance models and indigenous collective rights represent not merely policy coordination challenges, but also institutional governance frictions involving competing norms, authority structures, and knowledge legitimacy.

By assuming its nature within research and innovation systems, IDG not only concerns technical arrangements regarding data management, but also raises broader institutional questions concerning authority over knowledge infrastructures, legitimacy of data ownership, and power asymmetries embedded within centralized governance systems. These governance tensions become particularly relevant within STI policy system where governance structures determine which types of knowledge are considered decent to be recognized, protected, and integrated into national innovation ecosystem.

Prior studies on governance in Indonesia has primarily focused on three areas: STI governance, digital and data governance, and Indigenous knowledge governance. Studies on STI governance have generally examined institutional reform, innovation system development, and challenges in coordinating research governance and innovation funding, including the ones pertaining institutional centralization following

the establishment of BRIN (Putera et al., 2022; Putera et al., 2025). Meanwhile, studies on digital and data governance have focused more on issues of data integration, interoperability, and digital transformation in public sector, including various institutional challenges, such as weak inter-agency coordination, overlapping authority, and inconsistent governance (Cerrly et al., 2025). On the other hand, studies related to Indigenous knowledge governance in Indonesia has generally focused on cultural preservation, digitalization, and the protection of traditional knowledge, as well as the risks of exploitation and weak community control within externally managed documentation systems (Kasih et al., 2021; Kurnilasari et al., 2018).

While these prior studies have made important contributions to understand STI governance, digital governance, and the protection of Indigenous knowledge, studies specifically examining IDG positioning within Indonesia's STI governance landscape are still very limited. Globally, existing literature on IDG has developed through discussions of Indigenous Data Sovereignty, the implementation of the CARE principles, and ethical governance mechanisms for Indigenous data. Nonetheless, theoretical and empirical gaps remain about how to translate these principles into institutional arrangements, regulations, and coordination mechanisms within national STI policy system, particularly in developing countries with increasingly centralized innovation governance and complex Indigenous institutional structures. Consequently, the relationship among centralized STI governance, data governance, and the recognition of Indigenous collective rights remains inadequately understood.

To understand how these issues emerge within Indonesia's STI policy system, this study combines the Institutional Theory with the STI Policy Review framework developed by the United Nations Conference on Trade and Development (UNCTAD). The Institutional Theory serves as the primary analytical lens for examining how regulative, normative, and cultural-cognitive dimensions shape governance arrangements related to IDG (Scott, 2014). This perspective enables us to analyze formal regulations as well as broader issues of legitimacy, authority, and institutional coherence that influence the governance of Indigenous data and knowledge. Moreover, the UNCTAD's STI Policy Review framework complements this analysis by

situating IDG within the broader STI governance system. This framework emphasizes policy coherence, institutional coordination, governance environments, and interactions among actors as key elements shaping innovation performance and knowledge-based development (UNCTAD, 2025). By combining these two perspectives, this study aims to provide a more comprehensive understanding of how governance tensions emerge between increasingly centralized STI governance structures and the collective rights of Indigenous peoples within Indonesia's evolving innovation ecosystem.

Therefore, building on these theoretical reasonings and analytical perspectives, this study addresses three research questions:

1. How is IDG positioned within Indonesia's STI policy system?
2. To what extent are regulatory instruments, institutional mandates, and coordination mechanisms aligned to support IDG positioning within Indonesia's STI policy system?
3. What structural gaps exist and what are their implications for the coherence of Indonesia's STI governance?

By addressing these questions, this study contributes in three ways. Firstly, it advances theoretical discussions by integrating the Institutional Theory and the STI systems perspective to explain tensions between centralized data governance and Indigenous collective rights within national innovation systems. Secondly, it empirically maps regulatory

arrangements, institutional mandates, and governance coordination mechanisms shaping IDG positioning within Indonesia's STI ecosystem. Thirdly, it contributes policy insights concerning institutional alignment strategies required to strengthen IDG integration into emerging STI governance frameworks.

II. ANALYTICAL FRAMEWORK

A. Indigenous Data Governance

Indigenous Data Governance (IDG) refers to the authority of Indigenous communities over the control, access, and use of data related to their knowledge systems, cultural resources, and collective identities (Kukutai & Taylor, 2016; Walter et al., 2021). Unlike conventional data governance, which is predominantly grounded in individual rights and technocratic regulation, IDG is rooted in principles of collective ownership, relational accountability, and epistemic plurality (Global Indigenous Data Alliance, 2019). This nature allows IDG to exert alternative conceptions of data authority, ownership, and legitimacy to challenge dominant data governance paradigms. These principles are further articulated within pertinent global frameworks for IDG, such as the CARE principles, which emphasize that data governance should be grounded in Indigenous rights, collective well-being, and ethical stewardship (Carroll et al., 2020). The CARE principles highlight the importance of recognizing Indigenous peoples as collective rights-holders and ensuring that data practices support their self-determination and cultural integrity.

C ollective Benefit	For inclusive development and innovation
	For improved governance and citizen engagement
	For equitable outcomes
A uthority To Control	Recognising rights and interests
	Data for governance
	Governance of data
R esponsibility	For positive relationships
	For expanding capability and capacity
	For indigenous values and world views
E thics	For minimising harm and maximising benefit
	For justice
	For future use

Figure 1. CARE Principles for IDG (source: Erickson et al., 2022)

While the concept of IDG has been extensively developed at the normative level, its institutional embedding within national policy systems remains uneven, particularly in the context of governance structures that are fragmented and shaped by competing policy logics. This gap highlights the need for an analytical framework that can assess not only the presence of IDG principles in policy documents, but also the extent to which these principles are institutionally supported and systemically aligned.

B. Institutional Embedding of IDG: A Three-Dimension Perspective

To examine how IDG is positioned within Indonesia's STI policy system, this study adopts the Scott's Institutional Theory, which consists of three dimensions: regulative, normative, and cultural-cognitive (Scott, 2014). This framework

was selected because challenges related to IDG are not limited to the existence of laws and regulations. Instead, the challenges also practically involve values, institutional norms, and the extent to which Indigenous knowledge systems are recognized within governance arrangements. This perspective is particularly relevant for understanding IDG, since tensions often arise not only due to regulatory gaps, but also due to differences in values, authority, and views regarding data ownership and knowledge governance. By examining these three dimensions together, the framework enables a more comprehensive assessment of how policy systems recognize, support, or constrain IDG. In this study, these three institutional dimensions are used to analyze both formal policy provisions and the broader institutional conditions that influence the governance of Indigenous-related data.



Figure 2. Three Institutional Dimensions (adapted from Scott (2014))

The first dimension (regulatory) refers to the extent to which formal rules, legal provisions, and policy instruments recognize and regulate authority over data, including the recognition of collective data rights. The second dimension (normative) examines how policy frameworks incorporate pertinent values, such as inclusivity, participation, and the recognition of Indigenous peoples' rights and interests. Lastly, the third dimension (cultural-cognitive) focuses on the underlying assumptions and knowledge perspectives embedded within governance arrangements, specifically to determine whether Indigenous peoples' knowledge systems are recognized as legitimate forms of knowledge. Together, these dimensions provide a systematic analytical framework for examining IDG beyond

merely formal regulatory recognition. This approach enables a more comprehensive understanding of institutional support for IDG by assessing not only legal arrangements, but also the norms, values, and knowledge assumptions that shape governance systems.

C. Institutional Alignment within STI Policy System

While the institutional perspective provides a foundation for understanding how IDG is recognized and legitimized within policy frameworks, the effectiveness of IDG integration is also shaped by the level of alignment among institutions within the broader STI system. Drawing on the STI systems perspective based on the UNCTAD's STI Policy Review framework, governance effectiveness is understood to depend

not only on the existence of formal regulations, but also on the interconnectedness of actors, institutional coordination mechanisms, governance arrangements, and enabling conditions operating across various levels of government and policy sectors (OECD, 2015; OECD, 2021; UNCTAD, 2025). From the STI systems perspective, institutions do not operate in isolation. Instead, they interact and influence each other across various policy domains, governance actors, and administrative levels. Such ecosystem would certainly trigger various forms of institutional misalignment, such as authority fragmentation across sectoral institutions, inconsistencies between national policies and local governance practices, as well as mismatches between dominant data governance paradigms and Indigenous knowledge systems.

Moreover, these misalignments not only indicate regulatory gaps, but also reflect broader tensions among differing institutional logics, governance priorities, and knowledge systems. In the context of IDG, these conditions can influence the extent to which collective rights, community authority, and Indigenous knowledge systems would be effectively accommodated within STI governance. The Institutional Theory, therefore, serves as a perspective in explaining how legitimacy, norms, and governance structures are formed and maintained within the pertinent policy system. Meanwhile, the STI systems perspective highlights how these institutional arrangements interact among various actors, levels of governance, and policy domains. By integrating these two perspectives, this study analyzes not only whether IDG principles have been institutionally recognized, but also how alignment or misalignment among institutions affects governance coherence, coordination capacity, and enabling conditions of IDG institutionalization within Indonesia's STI ecosystem.

Furthermore, the systems-level analysis also draws on the UNCTAD's STI Policy Review framework, which emphasizes the importance of policy coherence, institutional coordination, governance arrangements, interactions among actors, and enabling conditions as key elements of effective STI governance. This perspective provides an additional lens for assessing whether existing institutional arrangements would support or hinder IDG positioning within Indonesia's STI policy system. Therefore, policy support for IDG needs to be analyzed not only by examining internal institutional coherence, but also by

assessing the broader governance alignment within the multi-level system. This integrated perspective provides the basis for understanding whether existing STI policies, institutional mandates, coordination mechanisms, and governance arrangements collectively would support or hinder IDG integration into Indonesia's evolving STI landscape.

D. Analytical Approach

This study examines the institutional positioning of IDG within Indonesia's STI policy system by combining the Scott's Institutional Theory with the STI systems perspective. The Scott's regulative, normative, and cultural-cognitive dimensions serve as the primary analytical categories for examining how IDG is reflected in policy documents. To support systematic analysis, each institutional dimension is operationalized through a set of analytical indicators related to collective rights, Indigenous participation, knowledge recognition, and governance arrangements. The findings are then subsequently interpreted using the STI systems perspective informed by the UNCTAD's STI Policy Review framework, with particular attention to policy coherence, institutional coordination, governance arrangements, interactions among actors, and enabling conditions. This approach enables the assessment of both institutional support for IDG and its broader positioning within Indonesia's STI governance system.

These institutional dimensions are subsequently interpreted in relation to broader STI policy system dynamics to evaluate the degree of institutional alignment across governance sectors and administrative levels. This analysis considers whether institutional arrangements support policy coherence, institutional coordination, governance arrangements, interactions among actors, and enabling conditions necessary for IDG positioning within Indonesia's STI policy system. Within Indonesia's context, characterized by sectoral fragmentation, evolving digital governance structures, and multi-level governance arrangements, this integrated analytical approach enables a more systematic assessment of how institutional configurations would facilitate or constrain IDG integration. By integrating the Institutional Theory with the STI systems perspective, this study's scope shifts beyond normative discussions of IDG toward a broader analysis of governance coherence, institutional alignment, and policy support within emerging STI governance systems.

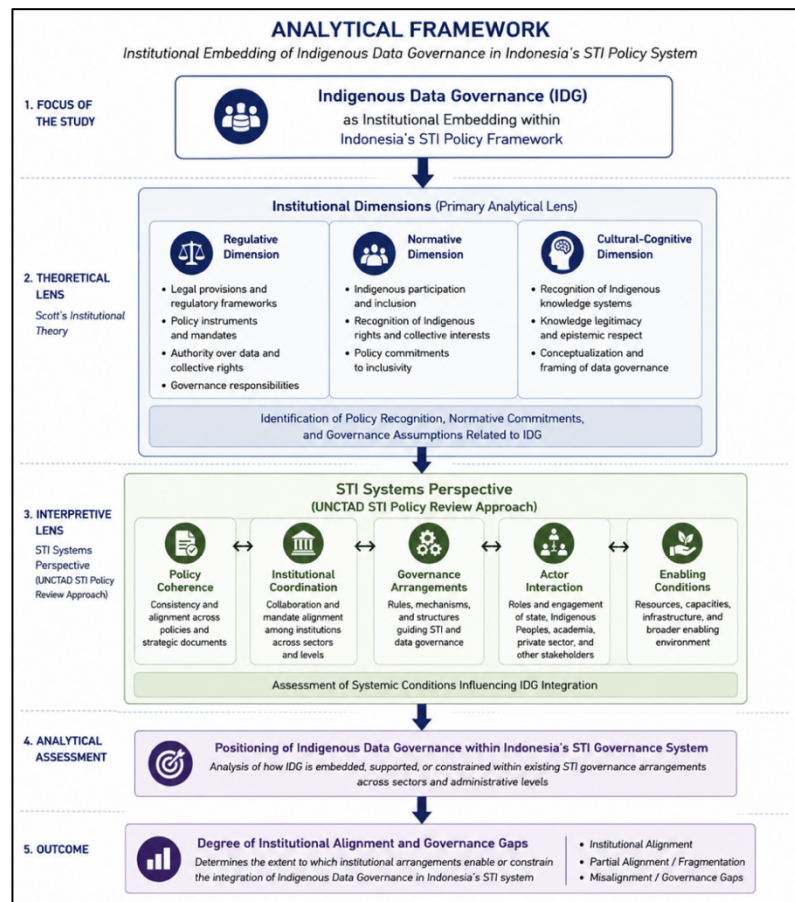


Figure 3. Analytical Framework for Assessing IDG Positioning within Indonesia's STI Policy System

III. METHODOLOGY

A. Research Design

This study adopts a qualitative research approach using document analysis as its primary method (Bowen, 2009). Document analysis is a systematic procedure for reviewing and evaluating documents to explore certain meaning, acquire understanding, and generate empirical knowledge over the matter being investigated. This approach is particularly well-suited for examining policy frameworks, since it allows for the analysis of both explicit policy provisions and implicit institutional meanings embedded within legal and regulatory texts. Data were analyzed qualitatively via a content processing based on existing conceptual framework (Hsieh & Shannon, 2005). In this study, the Scott's institutional dimensions—regulative, normative, and cultural-cognitive—were used as analytical lens to examine how IDG is represented in various STI policy documents in Indonesia. This framework helped in identifying the regulatory aspects, values and norms, as well as institutional understandings that shape the recognition and implementation of IDG.

Furthermore, the analysis remained open to other governance themes and patterns emerging from the documents, allowing for a more contextual interpretation of the policy dynamics being examined.

B. Data Sources

This study relies on policy and regulatory documents pertaining to STI governance, data governance, and Indigenous rights in Indonesia. Documents were selected purposively based on their relevance to institutional mandates, governance responsibilities, data governance arrangements, and the recognition of Indigenous communities within Indonesia's STI policy system. Following are three primary documents selected:

- 1) Law No. 11/2019 on the National System of Science and Technology
- 2) Law No. 27/2022 on Personal Data Protection
- 3) Law No. 6/2014 on Villages

To provide a broader understanding of Indonesia's STI governance ecosystem, the analysis also

incorporated five supporting policy documents as follows:

- 1) Presidential Regulation No. 78/2021 on BRIN
- 2) Presidential Regulation No. 39/2019 on One Data Indonesia
- 3) BRIN Regulation No. 2/2025 on Research Data Governance
- 4) Regulation of the Minister of Home Affairs No. 52/2014 on the Recognition of Indigenous Peoples
- 5) National Long-Term Development Plan (RPJPN) 2025–2045

The inclusion of both primary and supporting documents allowed this study to capture institutional arrangements operating across

multiple governance sectors and administrative levels.

C. Operationalization of Institutional Dimensions

The analytical framework was operationalized through a set of indicators derived from the Scott's institutional dimensions. These indicators were developed to assess how existing policy frameworks would recognize, support, or constrain IDG positioning within Indonesia's STI policy system.

These indicators provided the basis of coding and interpreting policy documents and supported a systematic assessment of IDG positioning within Indonesia's STI policy system.

Table 1. Operationalization of Institutional Dimensions and Their Analytical Indicators

Institutional Dimension	Analytical Indicator	Assessment Focus
Regulative	Recognition of collective data rights	Legal provisions governing collective ownership and authority over Indigenous-related data
	FPIC mechanisms	Presence of consent procedures governing research and data collection
	Institutional authority	Allocation of governance responsibilities across institutions
Normative	Indigenous participation	Inclusion of Indigenous communities within governance arrangements
	Recognition of Indigenous rights	Policy commitments supporting collective rights and inclusivity
	Community interests	Protection of Indigenous values and community interests
Cultural-Cognitive	Knowledge legitimacy	Recognition of Indigenous knowledge systems as legitimate knowledge forms
	Data framing	Whether data are framed as technical resources, individual assets, or collective cultural entities
	Governance assumptions	Underlying policy assumptions concerning ownership, authority, and data governance

D. Analytical Procedure

The analysis followed principles of qualitative content analysis (Schreier, 2012; Krippendorff, 2018) using a directed content analysis approach (Hsieh & Shannon, 2005). In this approach, existing theory provides the initial analytical categories guiding the coding process. Accordingly, the Scott's institutional dimensions, i.e., regulative, normative, and cultural-cognitive, were used as the primary coding categories for examining IDG positioning within Indonesia's STI policy system. As illustrated in Figure 3, the analysis comprised five stages in order: document selection, initial coding, categorization based on the Scott's institutional dimensions, cross-document comparison, and system-level interpretation using the UNCTAD's STI Policy Review framework.

E. Trustworthiness and Limitation

To enhance the analysis's robustness, this study employed an iterative coding process, cross-

document comparisons, and theoretical triangulation by integrating the Institutional Theory and the STI systems perspective. Consistency of interpretation was maintained by applying the same analytical indicators to all documents and then systematically comparing the findings across various policy and regulatory sources. This study focused on formal policy and regulatory frameworks, thus not directly capturing informal governance practices, customary institutional dynamics, and the experiences of indigenous communities in day-to-day practice. This delimitation aligns with this study's primary objective, i.e., to understand how the institutional positioning of IDG is shaped within Indonesia's STI policy system. Therefore, to acquire a deeper understanding about the governance dynamics that occur outside the formal policy framework, relevant further studies need to employ more aimed interviews, institutional observations, and community-based approaches.

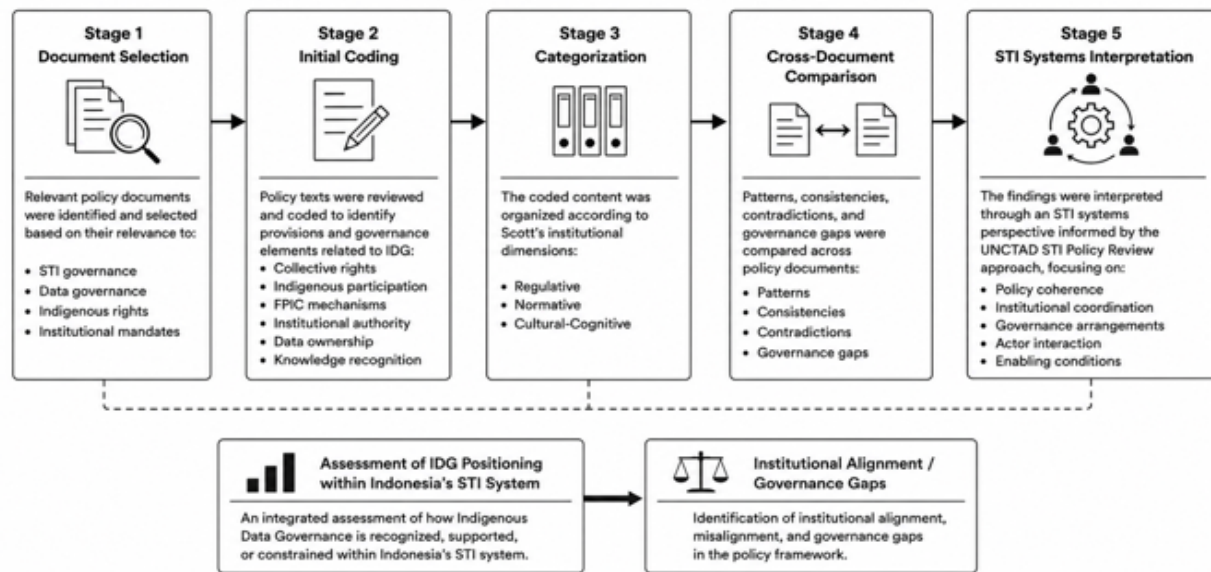


Figure 4. Analytical Procedure for Assessing IDG Positioning within Indonesia's STI Policy System.

IV. RESULTS

A. Positioning IDG within Indonesia's STI Policy System

Indonesia's Science, Technology, and Innovation (STI) policy system is increasingly shaped by data-driven governance, where the production, integration, and utilization of data play a central role in supporting research activities, innovation processes, and evidence-based policymaking. However, instead of being governed by a single comprehensive legal framework, data governance within Indonesia's STI policy system is structured through a set of regulations that operate across different policy domains and institutional levels. At the core of this system, Law No. 11/2019 on the National System of Science and Technology establishes the foundational framework for organizing research and innovation activities, including the strategic role of data governance in national development. This framework was further operationalized through sector-specific regulations, such as BRIN Regulation No. 2/2025, which provides technical guidelines for managing research data, including the data collection, standardization, storage, and interoperability within national research ecosystem.

Beyond the STI sector, broader data governance is controlled by cross-sectoral regulation, particularly Law No. 27/2022 on Personal Data Protection, which introduces a rights-based approach to data governance by emphasizing individual control over personal data. Although not specifically designed to STI, this regulation

significantly affects research practices, especially the ones involving human subjects and sensitive data. In addition, Law No. 6/2014 on Villages provides an important, though indirect, dimension by recognizing community authority, including Indigenous and local communities, as legitimate governance actors. Although does not explicitly regulate data governance, the law provides a normative foundation for understanding community-based governance, which becomes particularly relevant when research data is derived from local knowledge systems and cultural practices. To provide an overview of the regulatory environment shaping IDG positioning within Indonesia's STI policy system, Table 2 summarizes the principal regulatory frameworks examined in this study. The documents selected represent key policy domains relevant to STI governance, data governance, Indigenous rights and community recognition, as well as institutional mandates related to research, data management, and local governance.

As shown in Table 2, Indonesia's STI governance landscape is shaped by multiple regulatory frameworks operating across different policy domains. Several regulations primarily focus on research governance and innovation coordination, while others address data protection, community governance, and national data integration. Collectively, these frameworks indicate that governance arrangements relevant to IDG are dispersed across multiple sectors and institutional levels rather than being organized within a single integrated governance framework. In addition to three principal regulatory frameworks, the

analysis also drew upon five supporting policy documents, i.e., Presidential Regulation No. 78/2021 on BRIN, Presidential Regulation No. 39/2019 on One Data Indonesia, BRIN Regulation No. 2/2025 on Research Data Governance, Regulation of the Minister of Home Affairs No. 52/2014 on the Recognition of Indigenous Peoples, and the National Long-Term Development Plan (RPJPN) 2025–2045. These documents provide additional insights into the institutional mandates, coordination mechanisms, and governance arrangements operating across Indonesia's STI ecosystem.

This institutional configuration creates important governance challenges, particularly the one concerning research activities involving Indigenous knowledge and community interests.

Although BRIN has been playing a central role in strengthening research coordination, interoperability, and national data integration as part of Indonesia's STI transformation agenda, existing governance arrangements still largely emphasize standardization and data management objectives. On the other hand, issues related to collective authority, Indigenous rights, and community-based governance remain fragmented across different regulatory domains. Consequently, responsibilities related to the governance of Indigenous-related data are distributed across STI governance, data governance, and local governance frameworks, practically causing uncertainty regarding authority, accountability, and institutional responsibilities.

Table 2. *Principal Regulatory Frameworks Examined in the Analysis*

Regulation	STI Governance	Data Governance	Indigenous Rights/ Community Recognition	Institutional Mandates
Law No. 11/2019 on the National System of Science and Technology	Establishes the national STI governance framework and research coordination mechanisms	Promotes data utilization and knowledge management within STI activities	Recognizes traditional knowledge as part of national STI resources	Assigns responsibilities for research governance and STI development
BRIN Regulation No. 2/2025 on Research Data Governance	Supports implementation of national STI governance through research data management	Regulates research data collection, storage, interoperability, and sharing	Does not explicitly address Indigenous rights or collective data governance	Defines institutional responsibilities for research data governance within BRIN
Law No. 27/2022 on Personal Data Protection	Influences STI activities involving human subjects and personal data	Establishes legal protections for personal data and consent mechanisms	Focuses on individual rights rather than collective Indigenous rights	Allocates responsibilities for personal data governance and compliance
Law No. 6/2014 on Villages	Provides a governance framework for local and customary communities	Does not explicitly regulate data governance	Recognizes community participation, customary institutions, and local authority	Assigns governance responsibilities to villages and customary institutions
Presidential Regulation No. 39/2019 on One Data Indonesia	Supports evidence-based policymaking and national governance coordination	Promotes data integration, interoperability, and data standards across institutions	Does not explicitly address Indigenous-related data governance	Establishes coordination mechanisms among government institutions

B. Regulatory Dimension: Legal Recognition of IDG

The regulative dimension analysis results reveal that Indonesia's STI policy system provides limited and fragmented regulatory recognition of IDG. Across the three key legal instruments examined, none explicitly recognizes Indigenous communities as collective data rights holders. Law No. 11/2019 on the National System of Science and Technology establishes a comprehensive regulatory framework for research governance, including provisions related to data management and research ethics. However, the law does not explicitly recognize Indigenous communities' authority over data derived from their knowledge systems, territories, or cultural practices. Instead, it assumes that research data falls under institutional or state control, thereby overlooking the possibility of community-based data

governance. Similarly, Law No. 27/2022 on Personal Data Protection provides a structured legal framework for data governance, but delimits itself to individual data rights, since the law defines data subjects as individuals and does not provide mechanisms for collective or communal data governance. As a result, forms of data that are inherently collective, such as traditional knowledge or biocultural data, remain outside the scope of existing legal protection.

Likewise, Law No. 6/201 on Villages introduces recognition of customary governance (*desa adat*), which could theoretically support local authority over data. However, this recognition does not extend explicitly to data governance, since the law does not define community rights over data, nor does it regulate external data extraction or research practices within village territories. Overall, across all of these three policies, a major regulatory gap

is the absence of necessary mechanisms, such as Free, Prior, and Informed Consent (FPIC), for research and data collection involving Indigenous communities. This drawback indicates that Indonesia's STI policy system has not yet established a clear legal foundation of IDG institutional positioning. Furthermore, existing governance arrangements continue to emphasize state-centered research governance and individual rights protection, whereas Indigenous-related data are often collective, culturally embedded, and community-based in nature. As a result, matters regarding authority, consent, and control over Indigenous-related data remain insufficiently regulated, particularly when research activities involve traditional knowledge, cultural heritage, or community-based information systems. Although BRIN has been playing a central role in coordinating national research data governance, current regulatory arrangements have not yet clearly defined how governance authority and decision-making responsibilities should be shared among state institutions, research organizations, and Indigenous communities.

C. Normative Dimension: Values and Policy Commitments

The normative dimension analysis results indicate a partial but insufficient alignment between existing regulations and IDG principles. While several policies express general commitments to inclusivity, participation, and community recognition, these commitments do not explicitly acknowledge Indigenous data rights or governance. Law No. 11/2019 reflects a strong emphasis on scientific advancement and innovation, but does not articulate normative commitments to protect Indigenous knowledge systems or ensure community participation within data governance. This suggests that scientific development is prioritized over considerations of knowledge equity or Indigenous rights. Moreover, Law No. 27/2022 frames data protection as an individual right, emphasizing privacy, consent, and personal autonomy. While these principles are important for strengthening Indonesia's STI ecosystem, they do not essentially capture IDG's collective nature. The absence of normative recognition of collective rights reflects a broader policy orientation that privileges individual data frameworks over communal ones. In contrast, Law No. 6/2014 demonstrates stronger normative alignment with IDG principles by recognizing community participation and customary governance structures. However, this recognition remains general and is not operationalized in

relation to data governance. As a result, the normative support for IDG remains implicit rather than explicit. The analysis results as a whole, therefore, suggest that while elements of inclusivity and participation are present, there is no coherent normative framework that explicitly supports IDG integration into Indonesia's STI policy system. These findings also indicate competing institutional logics operating within Indonesia's governance system. STI governance frameworks prioritize innovation performance, data integration, and research productivity, while IDG emphasizes collective authority, community participation, and stewardship responsibilities. The absence of institutional mechanisms connecting these two priorities contributes to normative fragmentation and limits the incorporation of Indigenous collective interests within emerging STI governance arrangements. These normative priorities tend to privilege state and institutional objectives related to innovation performance and data management, while providing limited recognition of Indigenous communities as rights-bearing actors within data governance arrangements.

D. Cultural-Cognitive Dimension: Framing of Data and Knowledge

The cultural-cognitive dimension analysis results highlight a fundamental limitation in how data and knowledge are conceptualized within Indonesia's STI policy system. Across the examined policies, data are predominantly framed as a technical, administrative, and economic resource rather than as a culturally embedded and collectively governed entity. Law No. 11/2019 reflects a modernist and technocratic understanding of knowledge production, where scientific data is treated as an output of formal research systems. Meanwhile, Indigenous knowledge systems are not explicitly recognized as legitimate or distinct forms of knowledge, reinforcing a hierarchy in which scientific knowledge is prioritized. Law No. 27/2022 further emphasizes this perspective by conceptualizing data primarily in terms of personal information and privacy. The law's cognitive framework assumes that data are inherently individual, thereby excluding forms of collective knowledge and shared cultural data from its scope. Meanwhile, Law No. 6/2014 represents a partial shift by acknowledging customary governance structures, even though its implicit recognition to alternative knowledge systems does not extend to data governance or knowledge sovereignty and therefore results in an

incomplete cognitive alignment with IDG principles.

Overall, these findings indicate a cognitive misalignment between the dominant policy framework and the epistemology of Indigenous communities. Limited recognition of Indigenous knowledge as a legitimate form of knowledge with its own governance mechanisms is a major obstacle of IDG institutionalization. This cognitive configuration also reflects the epistemic imbalance within STI governance. Scientific knowledge generated through formal research institutions tends to be positioned as the most legitimate and manageable form of knowledge within data governance frameworks, while Indigenous knowledge systems remain largely unrecognized within these governance arrangements. This imbalance would limit the recognition of Indigenous communities, not only as knowledge providers, but also as governance actors who possess legitimate authority to determine the collection, access, and use of information relevant to their communities. Beyond recognition, this cognitive configuration

also influences how governance responsibilities are distributed within STI policy system. When Indigenous knowledge is positioned more as a data source or research object and less as a knowledge system with community authority, governance arrangements tend to emphasize data collection, documentation, and utilization rather than stewardship, community consent, and collective control. As a result, amid the research process, indigenous communities are frequently positioned as information providers rather than as actors who possess roles and authorities within data governance itself.

E. Institutional Alignment and Governance Gaps

To facilitate cross-dimensional analysis, the findings from the regulatory, normative, and cognitive-cultural dimensions were synthesized and then interpreted using the STI systems perspective based on the UNCTAD's STI Policy Review framework. Table 3 presents the resulting institutional alignment assessment and highlights key governance challenges affecting IDG integration into Indonesia's STI policy system.

Table 3. *Institutional Alignment Assessment based on the Scott's Institutional Dimensions and the UNCTAD's STI Policy Review Framework*

Institutional Findings (Scott, 2014)	STI Governance Implications (UNCTAD, 2019)	Key Challenge
Limited recognition of collective data rights and absence of FPIC mechanisms (Regulative)	Weak policy coherence that integrates IDG principles into STI governance, data protection, and community governance	No integrated legal foundation for IDG
Indigenous participation and collective interests are only indirectly recognized (Normative)	Limited interactions among actors and weak institutional coordination between state institutions and Indigenous communities	Indigenous communities remain weakly represented within governance arrangements
Indigenous knowledge is insufficiently recognized as a governable knowledge system (Cultural-Cognitive)	Governance arrangements continue to prioritize technical and administrative data management	Indigenous communities are still positioned as objects providing data and knowledge, not as subjects who have authority in decision-making and data governance.
Governance responsibilities are distributed across BRIN, data protection institutions, and local governance actors (Cross-dimensional finding)	Fragmented institutional coordination and unclear accountability arrangements	Ambiguity regarding authority and decision-making over Indigenous-related data
Existing governance arrangements emphasize interoperability and data integration	Enabling conditions for collective rights, stewardship, and community authority remain underdeveloped	Institutional support for IDG remains weak

The assessment results indicate that challenges affecting IDG stem not only from the absence of specific legal provisions, but also from broader institutional misalignment across Indonesia's STI governance system. Regulatory gaps, limited Indigenous participation, and weak recognition of Indigenous knowledge collectively contribute to fragmented governance arrangements and impede the development of a coherent IDG institutionalization framework. These challenges are further reinforced by Indonesia's multi-level governance structure. While STI governance

increasingly emphasizes centralized coordination through authorized institutions, such as BRIN, governance concerning Indigenous communities frequently operates through local administrative arrangements and customary governance structures. As a result, governance responsibilities remain distributed across multiple actors and governance levels, causing ambiguity regarding authority, accountability, and implementation responsibilities. Without stronger policy coherence, institutional coordination, and enabling conditions, IDG is likely to remain

institutionally peripheral within Indonesia's evolving STI governance system.

V. DISCUSSION

A. Governance Tensions and Institutional Misalignment

The findings suggest that challenges surrounding the institutional positioning of Indigenous Data Governance (IDG) in Indonesia emerge not solely due to the absence of specific legal provisions. Instead, the challenges reflect broader tensions between competing governance logics operating within Indonesia's STI policy system. Current STI governance increasingly emphasizes research coordination, data integration, interoperability, and evidence-based policymaking to strengthen national innovation performance. In contrast, IDG emphasizes collective authority, community participation, and stewardship to govern data that are closely connected to Indigenous knowledge, cultural practices, and territorial identities. From the institutional perspective, these differing governance priorities contribute to the fragmentation identified in this study and help in explaining why IDG in Indonesia remains institutionally marginal within existing STI governance arrangements.

Comparison with global IDG principles, particularly the CARE and Ownership, Control, Access, and Possession (OCAP), further highlights these tensions. Both principles emphasize collective benefit, community authority, responsibility, and collective control over Indigenous-related data. However, Indonesia's current governance arrangements have largely evolved within a policy environment centered on state-led coordination, administrative integration, and national development objectives. Thus, in this context, rather than deciding whether it is necessary to adopt the CARE or OCAP principles, the recommended measure is determining how to accommodate collective governance principles within an STI policy system that is historically organized around centralized coordination and integrated data governance. In addition, these findings also indicate that the limited institutionalization of IDG occurs not only due to regulatory gaps, but also due to broader institutional arrangements that continue to prioritize state coordination and standardization over community-based governance authority.

The findings also reveal a broader issue about the positioning of Indigenous knowledge within Indonesia's STI policy system. Existing

governance arrangements tend to position Indigenous knowledge primarily as research data, cultural information, or objects of documentation, while providing limited recognition to Indigenous communities as actors who possess authority over how such knowledge is collected, accessed, managed, and utilized. This measure reflects a broader epistemic asymmetry within STI governance, where scientific knowledge produced through formal research institutions continues to be treated as the dominant and governable form of knowledge. In contrast, Indigenous knowledge systems remain insufficiently recognized within formal data governance arrangements. As a result, Indigenous communities are frequently positioned as providers of knowledge rather than as governance actors who possess legitimate authority over data and knowledge derived from their communities.

Another important finding concerns the concentration of governance authority within formal STI institutions. BRIN has become a central actor in coordinating research governance, research data management, interoperability, and national data integration. While these functions are important for strengthening Indonesia's STI ecosystem, existing governance arrangements still provide limited institutional mechanisms through which Indigenous communities can participate in decisions concerning Indigenous-related data. This measure causes an institutional asymmetry in which coordination authority is concentrated within formal state institutions, while community-based governance authority remains weakly institutionalized. Such conditions may bring unfavorable future impacts as Indonesia continues to expand integrated research data infrastructures and digital governance initiatives.

B. Governance Trade-offs and Policy Implications

The findings further highlight potential tensions between national data integration objectives and Indigenous data sovereignty. Efforts to strengthen interoperability, open science, and integrated research data infrastructures may generate important benefits for innovation and evidence-based policymaking. At the same time, Indigenous communities may seek greater control over the access, use, and sharing of culturally sensitive information. Rather than positioning these two objectives as mutually exclusive, future governance arrangements need to balance national research interests with collective rights, community stewardship, and culturally

appropriate governance practices. From governance perspective, this notion suggests that IDG should be strengthened not by limiting scientific collaboration or data integration, but rather by developing governance arrangements capable of accommodating multiple forms of authority and knowledge governance within Indonesia's STI policy system.

A related challenge also emerges from the relationship between IDG and existing intellectual property regimes. Indonesia's Copyright Law recognizes Traditional Cultural Expressions and provides legal protection for communal cultural heritage. However, the governance logics underlying such protection differs from those of IDG principles. Existing intellectual property arrangements largely position the state as the custodian of communal cultural assets, whereas IDG emphasizes community authority and collective decision-making regarding the management and use of Indigenous-related knowledge and data. This indicates that continuous efforts to strengthen IDG may require greater alignment not only across STI governance and data governance frameworks, but also between intellectual property regimes and community-based governance principles.

From policy perspective, this study suggests three priorities. Firstly, research and data governance frameworks need to provide clearer recognition of collective authority over Indigenous-related data. Secondly, necessary mechanisms, such as Free, Prior, and Informed Consent (FPIC), should be more systematically integrated into research processes involving Indigenous communities. Thirdly, stronger coordination is needed among national STI institutions, local governments, and Indigenous communities to reduce institutional fragmentation and clarify governance responsibilities. All of these measures, although would not thoroughly eliminate all governance tensions, would provide an important foundation for developing a more inclusive and context-sensitive approach to IDG institutionalization within Indonesia's evolving STI policy system.

VI. CONCLUSION

This study demonstrates that Indigenous Data Governance (IDG) remains institutionally marginal within Indonesia's Science, Technology, and Innovation (STI) policy system. Although elements of community recognition exist within village governance arrangements, existing STI governance, data governance, and community governance frameworks remain fragmented and provide limited supports for collective authority

over Indigenous-related data. As a result, substantial challenges persist regarding collective rights recognition, governance authority, participation, as well as stewardship of Indigenous knowledge and data. This study contributes to the growing literature on IDG by demonstrating that governance challenges cannot be viewed solely as regulatory gaps. By integrating the Institutional Theory with the STI systems perspective, the findings highlight how competing governance logics, institutional arrangements, and knowledge hierarchies shape the recognition of Indigenous authority within data-driven innovation systems. This study further demonstrates that tensions between national data integration objectives and Indigenous governance principles pose an inevitable challenge within emerging STI governance framework. From policy perspective, strengthening IDG requires greater recognition of collective authority over Indigenous-related data, more systematic integration of FPIC mechanisms, as well as stronger coordination among national STI institutions, local governments, and Indigenous communities. As data becomes an increasingly strategic resource, developing governance arrangements that balance innovation objectives with Indigenous rights and community stewardship would be essential for building a more inclusive and context-sensitive STI policy system.

Nevertheless, this study's main limitation needs to be addressed: the method primarily focused on analyzing national policy and institutional frameworks rather than examining how IDG is practically implemented at the community level. For this reason, future studies need to investigate how IDG principles could be operationalized within Indigenous communities in Indonesia. In this sense, particular attention should be given to how IDG principles may be adapted to the context of Indonesia, where Indigenous knowledge systems are often understood as forms of communal heritage governed through collective rights and responsibilities. Such approach would contribute to the development of more context-sensitive IDG models that are aligned with Indonesia's legal, institutional, and socio-cultural realities.

REFERENCES

- Bowen, G. A. (2009). Document analysis as a qualitative research method. *Qualitative Research Journal*, 9(2), 27–40. <https://doi.org/10.3316/QRJ0902027>

- Carroll, S. R., Garba, I., Figueroa-Rodríguez, O. L., Holbrook, J., Lovett, R. W., Materechera, S., Parsons, M., Raseroka, K., Rodriguez-Lonebear, D., Rowe, R. K., Sara, R., Walker, J. D., Anderson, J., & Hudson, M. (2020). The CARE principles for indigenous data governance. *Data Science Journal*, 19(1), 1–12. Scopus. <https://doi.org/10.5334/DSJ-2020-043>
- Carroll, S. R., Rodriguez-Lonebear, D., & Martinez, A. (2019). Indigenous data governance: Strategies from United States native nations. *Data Science Journal*, 18(1). Scopus. <https://doi.org/10.5334/dsj-2019-031>
- Cerrly, C., As-syahrani, N. S., Nursahidin, N., & Sutarjo, M. (2025). Data integration through Cirebon One Data. *Indonesian Journal of Advanced Research*, 4(7), 1241–1256. <https://doi.org/10.55927/ijar.v4i7.15105>
- Dunn, W. N. (2018). *Public policy analysis: An integrated approach* (6th ed.). Routledge.
- Edquist, C. (2005). Systems of innovation: Perspectives and challenges. In J. Fagerberg, D. C. Mowery, & R. R. Nelson (Eds.), *The Oxford handbook of innovation* (pp. 181–208). Oxford University Press.
- Erickson, R. L., Selvathesan, N., & Dickens, A. R. W. (2022). Kidney health of Indigenous children: Insights from Australia, Aotearoa New Zealand, and Canada. *Current Pediatrics Reports*, 10, 227–234. <https://doi.org/10.1007/s40124-022-00274-z>
- Global Indigenous Data Alliance. (2019). CARE principles for Indigenous data governance. Global Indigenous Data Alliance. <https://www.gida-global.org/care>
- Hsieh, H.-F., & Shannon, S. E. (2005). Three approaches to qualitative content analysis. *Qualitative Health Research*, 15(9), 1277–1288. <https://doi.org/10.1177/1049732305276687>
- Janssen, M., Charalabidis, Y., & Zuiderwijk, A. (2012). Benefits, adoption barriers, and myths of open data and open government. *Information Systems Management*, 29(4), 258–268.
- Kasih, D. P. D., Dharmawan, N. K. S., Putra, I. B. W., Sudiarawan, K. A., & Rakhima, A. S. (2021). The exploitation of indigenous communities by commercial actors: Traditional knowledge and traditional cultural expression. *European Journal of Education and Culture Studies*, 5(1), 1–15. <https://doi.org/10.46827/ejecs.v5i1.898>
- Krippendorff, K. (2018). *Content analysis: An introduction to its methodology* (4th ed.). SAGE Publications.
- Kukutai, T., & Taylor, J. (Eds.). (2016). *Indigenous data sovereignty: Toward an agenda*. ANU Press. <https://doi.org/10.22459/CAEPR38.11.2016>
- Kurnilasari, D. T., Yahanan, A., & Rahim, R. A. (2018). Indonesia's traditional knowledge documentation in intellectual property rights' perspective. *Sriwijaya Law Review*, 2(1), 110–130. <https://doi.org/10.28946/slrev.vol2.iss1.114>
- Law of the Republic of Indonesia No. 6/2014 on Villages. (2014).
- Law of the Republic of Indonesia No. 11/2019 on the National System of Science and Technology. (2019).
- Law of the Republic of Indonesia No. 27/2022 on Personal Data Protection. (2022).
- Lundvall, B.-Å. (Ed.). (2010). *National systems of innovation: Toward a theory of innovation and interactive learning*. Anthem Press.
- OECD. (2015). *Data-driven innovation: Big data for growth and well-being*. OECD Publishing. <https://doi.org/10.1787/9789264229358-en>
- OECD. (2021). *OECD science, technology, and innovation outlook 2021: Times of crisis and opportunity*. OECD Publishing. <https://doi.org/10.1787/75f79015-en>
- Prehn, J., & Walter, M. (2023). Indigenous data sovereignty and social work in Australia. *Australian Social Work*, 76(3), 371–378. (WOS:000991701500001). <https://doi.org/10.1080/0312407X.2023.2186256>
- Putera, P. B., Widianingsih, I., Ningrum, S., Suryanto, S., & Rianto, Y. (2022). Science, technology and innovation (STI) ecosystems in Indonesia (1945–2021): A historical policy analysis. *History of Science and Technology*, 12(2), 302–319. <https://doi.org/10.32703/2415-7422-2022-12-2-302-319>
- Putera, P. B., Mardiyanti, M., Handoko, L. T., & Suestiningtyas, N. T. A. (2025). Research and innovation funding policy in Indonesia in the post-2019 national science and technology system era. *Viešoji Politika ir Administravimas*, 24(3), 295–310.

- <https://doi.org/10.5755/j01.ppaa.24.3.42131>
- Rainie, S. C., Schultz, J. L., Briggs, E., Riggs, P., & Palmanteer-Holder, N. (2017). Data as a strategic resource: Self-determination, governance, and the data challenge for indigenous nations in the United States. *International Indigenous Policy Journal*, 8(2).
- Regulation of the President of the Republic of Indonesia No. 39/2019 on One Data Indonesia. (2019).
- Regulation of the President of the Republic of Indonesia No. 78/2021 on the National Research and Innovation Agency. (2021).
- Schnarch, B. (2004). Ownership, Control, Access, and Possession (OCAP) or self-determination applied to research: A critical analysis of contemporary First Nations research and some options for First Nations communities. *Journal of Aboriginal Health*, 1(1), 80–95.
- Schreier, M. (2012). *Qualitative content analysis in practice*. SAGE Publications.
- Scott, W. R. (2014). *Institutions and organizations: Ideas, interests, and identities* (4th ed.). SAGE Publications.
- UNCTAD. (2019). *A framework for science, technology and innovation policy reviews: Helping countries leverage knowledge and innovation for development*. United Nations Conference on Trade and Development.
- Walter, M., Kukutai, T., Carroll, S. R., & Rodriguez-Lonebear, D. (Eds.). (2021). *Indigenous data sovereignty and policy*. Routledge.
<https://doi.org/10.4324/9781003004033>
- Wilkinson, M. D., Dumontier, M., Aalbersberg, I. J., Appleton, G., Axton, M., Baak, A., Blomberg, N., Boiten, J.-W., da Silva Santos, L. B., Bourne, P. E., Bouwman, J., Brookes, A. J., Clark, T., Crosas, M., Dillo, I., Dumon, O., Edmunds, S., Evelo, C. T., Finkers, R., ... Mons, B. (2016). The FAIR guiding principles for scientific data management and stewardship. *Scientific Data*, 3(1), 160018.
<https://doi.org/10.1038/sdata.2016.18>
- WIPO - World Intellectual Property Organization. (2022). *The protection of traditional knowledge: Draft articles* (WIPO/GRTKF/IC/47/14). World Intellectual Property Organization.