

## **Governing PBB-P2 Data through SiBUNGO: A Policy Framework for Mandailing Natal**

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### **Abstract**

The launch of SiBUNGO, a geospatial-based system for rural and urban land and building tax (PBB-P2) administration in Mandailing Natal Regency, creates an opportunity to connect taxable-object information with public services and revenue administration. However, publicly available evidence does not yet establish whether the system has improved data quality or revenue outcomes. This article develops a prospective data-governance framework for SiBUNGO through desk-based policy analysis. It examines relevant regulations, publicly available local-government and institutional documents, and scholarly studies selected for their relevance to PBB-P2 administration, geospatial systems, interoperability, and public-sector data governance. The material was interpreted across five dimensions: data quality, administrative processes, interoperability, institutional capacity, and the use of data for planning and evaluation. Documentary evidence establishes the system's reported functions and policy setting; it does not establish implementation outcomes. On that basis, the article proposes five linked measures: data standards and quality audits, risk-based updating, lawful and phased interoperability, institutional and staff capacity-building, and decision-oriented dashboards. A three-phase roadmap and qualitative comparison of policy alternatives translate these measures into an implementation framework. The article argues that SiBUNGO should be treated as a potential data-governance infrastructure rather than evidence, at this stage, of increased PBB-P2 revenue.

**Keywords:** data governance, pbb-p2, sibungo, geospatial, locally generated revenue, mandailing natal

### **Introduction**

Fiscal decentralisation positions locally generated revenue (*Pendapatan Asli Daerah* or PAD) as one of the foundations of local governments' capacity to finance public services and development in accordance with local needs. (Handraini et al., 2024; Pratama & Santioso, 2026) Within the framework of Law Number 1 of 2022 concerning Fiscal Relations between the Central Government and Regional Governments, regional revenue sources include regional taxes and levies, intergovernmental transfers, regional expenditure management, regional financing, and national fiscal policy synergy. (Undang-Undang Nomor 1 Tahun 2022 Tentang Hubungan Keuangan Antara Pemerintah Pusat Dan Pemerintahan Daerah, Lembaran Negara Republik Indonesia Tahun 2022 Nomor 4, Tambahan Lembaran Negara Republik Indonesia, 2022) Strengthening regional revenue should therefore not be understood merely

as an effort to increase revenue realisation, but also as part of building accountable and efficient fiscal administration capable of providing reliable information for development planning, budgeting, implementation, and evaluation.

Within the structure of regional taxation, Rural and Urban Land and Building Tax (*Pajak Bumi dan Bangunan Perdesaan dan Perkotaan* or PBB-P2) is strategically important because its revenue base derives from land and/or building objects that are spatially embedded within local administrative areas. This characteristic makes the quality of taxable-object and taxpayer databases a fundamental prerequisite for accurate tax assessment, tax-base expansion, receivables control, improved compliance, and revenue forecasting. Incomplete object attributes, discrepancies between object and taxpayer data, delayed updates, and weak location identification may reduce local governments' capacity to map revenue potential and formulate precise PBB-P2 management strategies. Research on property-tax administration indicates that the use of geographic information systems and remote sensing can support the development of more comprehensive, flexible, and continuously updated property-tax databases. (Balogun, 2019)

Digital transformation offers opportunities to address these issues, yet technology does not operate automatically. The digitalisation of tax administration requires high-quality data, clear business processes, institutional capacity, human resources, information security, and the use of data in decision-making. An empirical study of local government in Indonesia shows that integrating electronic data-collection applications with GIS-based mapping can expand the PBB-P2 tax-object database and improve administrative efficiency when supported by collaboration among regional revenue agencies, subdistrict governments, village administrations, and local implementers. (Nisa & Tamrin, 2025) Conversely, cross-regional research suggests that information and communication technology infrastructure and governance quality, when addressed separately, do not necessarily lead to stronger tax revenue mobilisation. (Mallick, 2021) These findings underline that digitalisation should be understood as a process of governance reform rather than merely the procurement or launch of an application.

This direction is consistent with Indonesia's national policy framework. Presidential Regulation Number 95 of 2018 on Electronic-Based Government Systems regulates governance, management, information and communication technology audits, implementation, acceleration, monitoring, and evaluation of electronic-based government systems. (Peraturan Presiden Nomor 95 Tahun 2018 Tentang Sistem Pemerintahan Berbasis Elektronik, Lembaran Negara Republik Indonesia Tahun 2018 Nomor 182, 2018) At the same time, Presidential Regulation Number 39 of 2019 on One Data Indonesia stipulates that government data governance must produce data that are accurate, up to date, integrated, accountable, easily accessible, and shareable across government institutions through compliance with data standards, metadata, data interoperability, and the use of reference codes and master data. The policy is explicitly designed to support development planning, implementation, and evaluation. (Peraturan Presiden Nomor 39 Tahun 2019 Tentang Satu Data Indonesia, Lembaran Negara Republik Indonesia Tahun 2019 Nomor 112, 2019) Accordingly, the digitalisation of PBB-P2 administration must be situated within the broader framework of strengthening local-government data governance that can be consistently used for service delivery, supervision, revenue-target planning, and performance evaluation.

In Mandailing Natal Regency, the local government launched the Geospatial-Based Land and Building Tax Information System (*Sistem Informasi Pajak Bumi dan Bangunan Berbasis Geospasial* or SiBUNGO) in August 2026. This innovation was introduced as an online PBB-P2 system that integrates taxable-object data with geospatial technology to support more accurate location identification, easier data access, faster data updating, and real-time revenue monitoring. SiBUNGO has also been positioned as part of the local government's efforts to strengthen transparency, accountability, and the optimisation of locally generated revenue.(ANTARA Sumatera Utara, 2026) This development is particularly relevant because the Regional Revenue Agency of Mandailing Natal Regency has also been involved in developing the 2026–2030 Roadmap for the Electronification of Local Government Transactions, which aims to expand transaction digitalisation and strengthen local financial governance.(ANTARA Sumatera Utara, 2025)

Publicly available material reviewed for this article does not provide a sufficiently comparable local baseline for registered PBB-P2 objects, geospatial mapping coverage, validated records, arrears, and pre- and post-launch revenue performance. The absence of these indicators limits assessment of SiBUNGO's implementation and fiscal effects. Accordingly, the present analysis treats official descriptions of the system as evidence of its stated functions and policy intentions, not as independent confirmation of data accuracy, real-time operation, improved compliance, or reduced revenue leakage.

Nevertheless, the launch of a digital system does not automatically guarantee that PBB-P2 data meet quality standards, are integrated into tax-administration business processes, or are used as a basis for revenue-planning decisions. Experiences across various jurisdictions demonstrate that the benefits of digital tax systems are highly dependent on reliable tax registries, the integration of cadastral and financial data, infrastructure readiness, digital literacy, institutional support, and data-security arrangements.(Cárdenas-López, 2026) At the level of property-tax administration, the use of GIS must also be accompanied by field-verification procedures, updates to object attributes, and linkages between spatial data and tax-assessment and payment data.(Yildirim & Ural, 2020) Since SiBUNGO remains a relatively new innovation, there is not yet sufficient publicly available evidence to conclude that it has increased PBB-P2 realisation or PAD in Mandailing Natal Regency. This limitation makes policy analysis particularly important: attention must be given to the governance conditions that enable the innovation to generate sustainable fiscal value and public-service benefits.

Existing studies illuminate important but different questions. Research on GIS-supported property taxation explains how spatial information can assist the identification and updating of taxable objects, while studies of local tax digitalisation examine administrative efficiency, collaboration, services, or revenue-related outcomes. (Nisa & Tamrin, 2025; Mandiri et al., 2024) These studies provide reasons to consider digital and geospatial tools, but they do not themselves specify how a newly launched local system should establish data standards, assign responsibility across administrative stages, govern lawful data exchange, and generate information for planning before implementation outcomes can be measured. This article addresses that narrower, early-stage policy problem. Its contribution is an ex ante governance framework, not an evaluation of SiBUNGO's effectiveness: it connects documentary evidence and applicable policy principles to five governance dimensions,

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compares three policy options against explicit criteria, and translates the preferred option into a staged roadmap.

Therefore, this article aims to analyse the needs and formulate strategies for strengthening geospatial-based PBB-P2 data governance through SiBUNGO in supporting the optimisation of locally generated revenue in Mandailing Natal Regency. The article employs a literature-review approach and policy document analysis by examining regulations, publicly available local-government information, official publications, and scholarly literature on data governance, regional tax digitalisation, and the use of geospatial information in property-tax administration. Its contribution lies in formulating a policy model that positions SiBUNGO not merely as a tax application, but as a data-governance infrastructure supported by data standardisation, risk-based updating, measured interoperability, strengthened institutions and human resources, and dashboards for regional-revenue planning and performance evaluation.

Analytically, the framework links five governance questions to five policy responses: whether records are reliable to data standards and audits; whether records remain current to risk-based updating and defined workflows; whether relevant systems can exchange information lawfully to controlled interoperability; whether responsibilities and skills are adequate to institutional and staff development; and whether information informs decisions to dashboards and evaluation routines. These connections organise the document analysis and the subsequent comparison of alternatives; they are propositions for policy design rather than findings from field observation.

## Method

This article employs desk-based qualitative policy analysis combining a focused review of scholarly and institutional literature with analysis of legal and policy documents. The literature review provides analytical insights into property-tax administration, geospatial information systems, regional tax digitalisation, and public-sector data governance. Document analysis establishes the applicable policy framework and the publicly reported context of SiBUNGO. These two strands are then used to develop and compare prospective policy options rather than to evaluate the system's observed effectiveness or causal effect on revenue.

The source corpus was assembled purposively on the basis of relevance to five subjects: PBB-P2 or property-tax administration; geospatial information in tax administration; data quality and updating; interoperability and public-sector data governance; and regional-government digitalisation. The scholarly and analytical publications cited in the article date from 2019 to 2026. The bibliography contains 12 scholarly or analytical publications, four distinct legal instruments, and five local, governmental, or institutional information sources. The four legal instruments are Law Number 1 of 2022, Presidential Regulation Number 95 of 2018, Presidential Regulation Number 39 of 2019, and Minister of Home Affairs Regulation Number 56 of 2021; the two bibliography entries for Presidential Regulation Number 39 of 2019 refer to the same instrument and are counted once. The five contextual or institutional sources comprise two ANTARA reports, the official SiBUNGO portal, a Mandailing Natal Regency Government publication, and a Ministry of Home Affairs ETPD guidance document. Sources were retained when they made a substantive contribution to the article's legal context, local setting, analytical framework, or policy options. Duplicate references and

claims whose provenance could not be established were not treated as independent evidence. Government announcements and news reports were used to identify SiBUNGO's reported launch, stated functions, and policy intentions, not to verify whether anticipated improvements had occurred.

The material was read and organised against five dimensions derived from the article's policy question and the reviewed governance principles: (1) data quality and updating, (2) PBB-P2 administrative processes, (3) interoperability and data protection, (4) institutional responsibilities and capacity, and (5) the use of data for planning and evaluation. Passages relevant to more than one dimension were considered under each applicable dimension. Interpretation distinguished four types of proposition: a requirement stated in a legal instrument, a condition or function reported in publicly available local material, an insight drawn from research conducted elsewhere, and a policy inference developed by this article. Where sources differed in emphasis or evidentiary strength, the analysis gave priority to the scope and status of the underlying source: an official statement of expected benefits was not treated as proof of achieved benefits, and findings from other jurisdictions were not treated as direct evidence about Mandailing Natal. The five dimensions were then translated into governance requirements, used to compare three policy alternatives, and carried forward into proposed actions, monitoring indicators, and transition conditions for a phased roadmap.

The three alternatives were compared using five qualitative criteria. *Relevance* refers to the extent to which an alternative addresses the five governance dimensions; *institutional feasibility* concerns whether responsibilities can plausibly be assigned within existing local-government arrangements; *resource requirements* concern the relative demands on personnel, coordination, training, and technical development; *implementation risk* concerns potential disruption, poor data quality, and privacy or security exposure; and *sustainability* concerns whether standards, routines, and review practices can be maintained beyond initial deployment. Relevance, feasibility, and sustainability were characterised as limited, moderate, or strong, while resource requirements and implementation risk were characterised as low, moderate, or high. These labels express reasoned comparisons of policy design, not measured performance or ratings validated with Bapenda officials. An alternative was preferred if it addressed all five governance dimensions and its principal risks could be managed through staged implementation; lower initial resource demand was not, by itself, decisive. Because the study relies on secondary evidence and SiBUNGO was introduced recently, the analysis does not establish whether the system has improved PBB-P2 data quality, taxpayer compliance, revenue realisation, or locally generated revenue.

## Results and Discussion

### SiBUNGO and the Direction of PBB-P2 Digitalisation in Mandailing Natal Regency

Strengthening locally generated revenue (*Pendapatan Asli Daerah* or PAD) cannot be separated from the capacity of local governments to establish revenue administration that is accurate, transparent, and responsive to changes in both taxable objects and taxpayers. In the administration of Rural and Urban Land and Building Tax (*Pajak Bumi dan Bangunan Perdesaan dan Perkotaan* or PBB-P2), this requirement becomes particularly important because taxable land and building objects have spatial characteristics, undergo physical and administrative changes, and are distributed across extensive territories. PBB-P2

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administration therefore requires a database that not only records the identity and assessed value of taxable objects, but also identifies their location, status, and updated changes. Geospatial technology is relevant because it enables the integration of spatial and non-spatial data within a single information system, allowing local governments to improve the accuracy of object identification, support data updating, and strengthen property-tax administrative oversight.(Balogun, 2019)

In Mandailing Natal Regency, this direction of digitalisation is reflected in the introduction and launch of the Geospatial-Based Land and Building Tax Information System (*Sistem Informasi Pajak Bumi dan Bangunan Berbasis Geospasial* or SiBUNGO) on 6 August 2026. The launch took place during a meeting of the Regional Digitalisation Acceleration and Expansion Team (*Tim Percepatan dan Perluasan Digitalisasi Daerah* or TP2DD), which also evaluated PAD achievements for the first semester of 2026. SiBUNGO was established through Mandailing Natal Regent Decree Number 970/0528/K/2026, dated 12 June 2026, and is positioned as an instrument for reforming regional revenue administration, particularly PBB-P2. The system was designed to address the need for accurate, integrated, and accessible PBB-P2 taxable-object data by using geospatial technology to improve the precision of location identification, accelerate data updating, and enable real-time revenue monitoring.(Pemerintah Kabupaten Mandailing Natal, 2026)

Publicly available information describes SiBUNGO as offering online PBB-P2 bill checking, GIS-based mapping, and information on payment through Bank Sumut (Badan Pendapatan Daerah Kabupaten Mandailing Natal, 2026). The local government also presents improved data accuracy, faster updating, stronger oversight, compliance, and reduced revenue leakage as intended benefits (Pemerintah Kabupaten Mandailing Natal, 2026). These statements establish the system's stated service functions and policy ambitions; they do not independently demonstrate the accuracy of underlying records, the timeliness of updates, changes in taxpayer behaviour, or fiscal effects. The analytical question is therefore what governance arrangements would allow those ambitions to be assessed and, where warranted, pursued.

Nevertheless, the launch of a digital system cannot yet be regarded as evidence that PBB-P2 administration has become effective or has increased PAD. SiBUNGO remains at an early stage of implementation, and adequate public data are not yet available regarding the level of system utilisation, the coverage of object mapping, data quality, database updates, or changes in PBB-P2 realisation following its introduction. SiBUNGO's strategic value should therefore be understood as an initial foundation for governance transformation rather than as proof of fiscal success. The literature on the digitalisation of regional tax data collection indicates that technologies such as electronic data-collection systems and GIS can strengthen PBB-P2 administration when accompanied by multi-level governmental coordination, consistent data validation, and the use of the system in decision-making processes.(Nisa & Tamrin, 2025)

The direction of strengthening SiBUNGO should also be situated within the broader policy framework of local financial digitalisation. The Government of Mandailing Natal Regency, through its Regional Revenue Agency, had previously undertaken coordinated assistance in preparing the 2026–2030 Roadmap for the Electronification of Local Government Transactions (*Elektronifikasi Transaksi Pemerintah Daerah* or ETPD). This

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agenda indicates that digitalisation is intended not only to provide non-cash transaction channels, but also to improve processes, governance, and the sustainability of local financial transformation.(ANTARA Sumatera Utara, 2025) The ETPD framework requires local governments to conduct gap analysis, establish priorities, prepare work plans, and determine implementation indicators and targets.(Kementerian Dalam Negeri Republik Indonesia, 2025) Within this framework, SiBUNGO can be developed as one of the regional-revenue data infrastructures connecting taxable-object registration, taxpayer services, payment transactions, revenue-realisation monitoring, and performance evaluation in a gradual manner.

Accordingly, the main issue can no longer be addressed merely by expanding technological features; it concerns how to organise data, business processes, institutional actors, and mechanisms for using the information generated by SiBUNGO. The shift from manual systems to digital services may improve access and administrative efficiency, yet sustainable fiscal and public-service benefits can only be achieved when spatial and administrative PBB-P2 data are standardised, regularly updated, securely connected, and routinely used in revenue-target setting and evaluation. The following section analyses the need to strengthen such data governance as a prerequisite for SiBUNGO to evolve from an application-based innovation into a policy instrument that genuinely supports the optimisation of PBB-P2 and PAD in Mandailing Natal Regency.

### **The Need to Strengthen Geospatial-Based PBB-P2 Data Governance**

SiBUNGO provides a digital foundation for PBB-P2 administration in Mandailing Natal Regency; however, the availability of an application and spatial maps does not, by itself, establish effective data governance. From the perspective of One Data Indonesia, government data must be accurate, up to date, integrated, accountable, easily accessible, and shareable through data standards, metadata, interoperability, and the use of reference codes or master data.(Peraturan Presiden Nomor 39 Tahun 2019 Tentang Satu Data Indonesia, 2019) These principles are relevant to PBB-P2 because a taxable object should not be recorded solely on the basis of its Tax Object Number (*Nomor Objek Pajak* or NOP) and assessed tax value. Rather, it should be consistently linked to location coordinates, address, land and building area and classification, taxpayer status, change history, and payment status. The integration of spatial and administrative attributes enables data to be used not only for service delivery, but also for object identification, data updating, target setting, and revenue oversight.

The first requirement concerns data quality and timeliness. The PBB-P2 database must be able to distinguish between validated objects, modified objects, new objects, duplicate records, and data that require re-verification. The literature on property-tax administration confirms that GIS is useful for recording and updating taxable objects; nevertheless, its effectiveness remains dependent on the accuracy of attribute data, validation procedures, and linkages between spatial data and tax-administration databases.(Balogun, 2019) SiBUNGO should therefore be supported by data standards and a data dictionary that specify minimum data elements, recording formats, data sources, update frequency, responsible officers, and data-quality audit mechanisms. This measure is essential to ensure that the information available in the system is not merely visually comprehensive, but also of sufficient quality to support fiscal decision-making.

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Any prospective access to population-administration data must first be assessed against the applicable legal basis and the competent authority's data-sharing procedures; this article does not assume that SiBUNGO already has such access. A proposed exchange arrangement should specify the verification purpose, the minimum fields needed, authorised roles, retention and deletion rules, authentication, encryption where appropriate, and auditable records of access and correction. Population data should not be copied or exposed simply because systems are technically interoperable. The precise legal instruments governing any proposed Dukcapil exchange and personal-data processing must be verified and cited before implementation is recommended.

The third requirement is institutional governance and the capacity to use data. Data governance encompasses technical arrangements, policies, regulations, and institutional frameworks throughout the data life cycle, including data creation, collection, storage, use, protection, access, sharing, and deletion.(Organisation for Economic Co-operation and Development, 2024) In practice, this requires clearly defined data-management roles, standard operating procedures for updating data, access-right matrices, data-security arrangements, change documentation, and coordination forums across organisational units. Technology development without a clear allocation of responsibilities risks creating dependence on particular operators, duplication of work, and data that are not utilised in planning processes. Experience with regional tax data collection in Indonesia indicates that successful digital transformation requires collaboration between regional revenue agencies, subdistrict administrations, and village governments, including in updating and verifying taxable-object databases.(Nisa & Tamrin, 2025)

Finally, SiBUNGO should be directed as a decision-making tool rather than solely as a bill-checking channel or a map of taxable objects. Local governments can use dashboards to monitor mapping coverage, the completeness of data attributes, objects requiring validation, and the number and trends of tax assessments, payments, and arrears by area. The OECD identifies leadership, standards, data architecture, interoperability, infrastructure, data protection, and organisational capacity as essential elements for building a data-driven public sector.(Organisation for Economic Co-operation and Development, 2019b) Since internal data on SiBUNGO's implementation are not yet publicly available, this section does not conclude that such weaknesses have occurred in Mandailing Natal Regency. Nevertheless, data quality, business processes, interoperability, institutional governance, and data utilisation constitute essential preconditions for SiBUNGO to develop from a digital service innovation into a PBB-P2 data-governance infrastructure that supports accountable revenue planning and performance evaluation

### **Policy Alternatives for Strengthening SiBUNGO**

The availability of SiBUNGO as a geospatial-based PBB-P2 information system creates an opportunity for Mandailing Natal Regency to improve service quality, database updating, and regional revenue oversight. However, digital innovation does not necessarily generate the same benefits when policy choices focus solely on technology. A data-driven public sector treats data as a strategic asset that must be responsibly governed, shared, and used to improve policy design, public services, organisational management, and programme evaluation.(Buttow, 2025; Organisation for Economic Co-operation and Development, 2019)

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Strengthening SiBUNGO must therefore take into account not only the application's technical capacity, but also the degree of data connectivity, the clarity of business processes, organisational capacity, and implementation sustainability.

The first alternative is to maintain SiBUNGO as an instrument of minimum service digitalisation. Under this alternative, the system would be used primarily for bill checking, the provision of PBB-P2 information, basic mapping of taxable objects, and payment facilitation. This option has the advantages of ease of implementation, relatively limited organisational change requirements, and immediate benefits for taxpayers in accessing information. The official SiBUNGO portal already provides online PBB-P2 bill-checking functions, GIS-based spatial mapping, and payment information through Bank Sumut.(Badan Pendapatan Daerah Kabupaten Mandailing Natal, 2026) Nevertheless, a minimum-service approach is limited because the available data may be used only as transactional information. The system may not necessarily become a basis for updating taxable objects, setting revenue targets, controlling arrears, or evaluating revenue performance. In other words, service-level digitalisation may improve access, but it is insufficient to build data-driven revenue-planning capacity.

The second alternative is technical system enhancement. This option may involve adding new features, expanding geospatial mapping coverage, improving interface usability, broadening payment channels, and providing access to a wider range of implementers. Its advantages include improved administrative efficiency, greater accessibility of services, and enhanced capacity of the system to display taxable-object information. Experience with the digital transformation of regional tax data collection in Indonesia indicates that the integration of data-collection applications and GIS can support the verification of taxable objects and improve the efficiency of administrative processes.(Nisa & Tamrin, 2025) However, technical strengthening alone entails the risk of a technology-centric approach, whereby the success of innovation is measured by the number of features or users rather than by data quality and its use in decision-making. Without data standards, updating procedures, a clear division of roles, and evaluation mechanisms, an increasingly complex system may still produce inconsistent, outdated data that are disconnected from Bapenda's planning and reporting processes.

The third alternative is the establishment of integrated PBB-P2 data governance based on SiBUNGO. This alternative positions the application as the core of a data-management ecosystem rather than merely a service channel or mapping tool. The policy encompasses the standardisation of PBB-P2 data elements and metadata; phased database auditing and updating; strengthened standard operating procedures from data collection through reporting; priority data integration across organisational units and institutions in accordance with their respective authorities; access-right and security arrangements; enhanced human-resource capacity; and the use of dashboards for target planning and performance evaluation. This approach is consistent with the principles of One Data Indonesia, which require government data to be governed through data standards, metadata, interoperability, reference codes, and master data.(Peraturan Presiden Nomor 39 Tahun 2019 Tentang Satu Data Indonesia, 2019) It is also consistent with the data-driven public-sector framework, which emphasises leadership, governance, data architecture, infrastructure, organisational capacity, data protection, and evaluation as elements that must be developed simultaneously.(Organisation for Economic Co-operation and Development, 2019)

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A comparison of the three alternatives indicates that minimum service digitalisation is suitable as an initial foundation, while technical system enhancement may improve the application's functions and reach. However, neither option is sufficient to ensure that PBB-P2 data can be used as a sustainable basis for revenue planning and performance control. The integrated data-governance alternative is more relevant because it places SiBUNGO within the full cycle of PBB-P2 administration: data collection, verification, assessment, service delivery, payment, updating, oversight, reporting, and evaluation. Although this alternative requires greater coordination, time, and investment in institutional capacity, it can be implemented gradually through the ETPD roadmap. Minister of Home Affairs Regulation Number 56 of 2021 establishes TP2DD as a regional forum responsible for preparing roadmaps and action plans, conducting outreach, implementing, monitoring, evaluating, and reporting ETPD implementation. (Peraturan Menteri Dalam Negeri Nomor 56 Tahun 2021 Tentang Tim Percepatan Dan Perluasan Digitalisasi Daerah Provinsi Dan Kabupaten/Kota Serta Tata Cara Implementasi Elektronifikasi Transaksi Pemerintah Daerah, 2021) Therefore, integrated PBB-P2 data governance based on SiBUNGO represents the most feasible policy alternative to be adopted as a strategic direction for Mandailing Natal Regency.

### **Strategy and Roadmap for Integrated PBB-P2 Data Governance Based on SiBUNGO**

The alternative of integrated PBB-P2 data governance based on SiBUNGO needs to be translated into a strategy that treats data as an organisational asset and a basis for decision-making, rather than merely as a by-product of digital services. This approach shifts the orientation of administration from the simple digitalisation of transactions towards the planned use of data to improve administrative quality, taxpayer services, revenue oversight, and performance evaluation. The OECD characterises a data-driven public sector as one that uses data to improve policy design, service delivery, and outcome monitoring, supported by integrated leadership, regulation, infrastructure, data architecture, and institutional capacity. (Organisation for Economic Co-operation and Development, 2019b, 2019a) In the context of Mandailing Natal, SiBUNGO has the potential to become a PBB-P2 data hub linking spatial information on taxable objects with data collection, service delivery, payment, and revenue-monitoring processes. Nevertheless, this potential requires a phased strategy so that system strengthening does not stop at feature expansion, but instead produces more consistent business processes and governance.

The first strategy is the standardisation and quality auditing of PBB-P2 data. The Regional Revenue Agency (*Bapenda*) should establish a data dictionary specifying minimum data elements, operational definitions, formats, sources, responsible officers, update frequency, and access levels for PBB-P2 data. These elements should include, at a minimum, the Tax Object Number (*Nomor Objek Pajak* or NOP), address, geographic coordinates, land and/or building area, object classification, taxpayer identity based on legitimate administrative records, assessed tax value, payment status, arrears status, and data-change history. A clear structure is essential to prevent duplication, inconsistencies in formats across data sources, and difficulties in linking maps with administrative records. This strategy is consistent with the One Data Indonesia principles, which require government data to meet data standards, include metadata, comply with interoperability rules, and use reference codes or master data. (Peraturan Presiden Nomor 39 Tahun 2019 Tentang Satu Data Indonesia, 2019) Data-

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quality audits may subsequently map the completeness, consistency, and timeliness of data, including the identification of objects without coordinates, records with incomplete attributes, duplicate NOPs, physical changes, or discrepancies in administrative information. Such audits do not need to be conducted simultaneously for all objects; Bapenda may begin with samples and priority areas to keep budgetary and workload requirements manageable.

The second strategy is risk-based database updating. Digitalisation will not produce optimal outcomes when data updating is reactive, sporadic, or dependent solely on taxpayers' requests. SiBUNGO should be used to establish a priority list for updating based on risk indicators, including objects with high assessed tax values, objects located in areas experiencing physical development, changes in land or building use, new objects, records with incomplete attributes, unvalidated objects, and objects showing discrepancies between location information and administrative data. A risk-based mechanism will focus data-collection activities on objects with greater revenue potential and a higher risk of administrative error. Verification can be undertaken through a combination of digital data tracing, administrative confirmation, and selective field validation. Under this approach, geospatial technology functions as a tool for setting priorities and supporting verification rather than as a complete substitute for administrative review or field observation.

The third strategy is gradual, measurable, and secure data interoperability. SiBUNGO will be more valuable if the information it contains can be linked to other lawful and relevant data sources. However, integration should not be interpreted as merging all data held by local government into a single application. A more realistic initial step is to select the integration needs most relevant to PBB-P2, such as territorial administrative information, addresses, and boundary changes obtained from subdistrict, village, or urban-village administrations, as well as SPBE architectural support from the Communication and Informatics Office (*Diskominfo*). Where necessary and permitted by the applicable legal basis and cooperation mechanisms, taxpayer data verification may be undertaken through lawful procedures with population-administration agencies. The interoperability principle under Presidential Regulation Number 39 of 2019 requires consistency in data syntax, structure, and semantics, as well as storage in open formats readable by electronic systems. (Peraturan Presiden Nomor 39 Tahun 2019 Tentang Satu Data Indonesia, 2019) Accordingly, data exchange should be accompanied by metadata standards, procedures for requesting and providing data, limitations on the purposes of data use, access logs, and access rights based on the duties of each user. These arrangements are necessary to balance data-verification needs with information-security protection.

The fourth strategy is the strengthening of institutions, business processes, human resources, and data protection. Bapenda should establish or designate a PBB-P2 data-governance management team comprising representatives from data collection and tax assessment, collection, service delivery, planning and evaluation, and information technology management. This team does not need to create a new bureaucratic structure; it may be integrated into existing functions through a formal decree, clearly assigned roles, and standard operating procedures. The principal need is to ensure clear responsibility for data creation, updating, validation, security, and utilisation. The SOPs should set out a workflow connecting data collection, verification, assessment, SPPT issuance, payment, recording, collection, correction, and reporting. At the same time, staff capacity-building should focus on basic

geospatial-data use, data-input standards, dashboard interpretation, change management, and awareness of data ethics and security. The digital-government policy framework emphasises that digital transformation requires leadership, coherent implementation, clear guidelines and standards, infrastructure, and data architecture supporting the data life cycle from creation to reuse.(Buttow, 2025) Dependence on a single operator or technology provider should therefore be reduced through documentation, tiered training, backup mechanisms, and periodic system-security evaluations.

The fifth strategy is the use of SiBUNGO dashboards for revenue planning and performance evaluation. The primary added value of a digital system lies not merely in its ability to store or display data, but in its ability to transform data into information relevant to decisions. Bapenda can develop tiered dashboards: an operational dashboard to monitor objects requiring verification and services being processed; a managerial dashboard to monitor assessments, payments, arrears, and data-update coverage; and a planning dashboard to identify revenue trends and determine priority activities and revenue targets for the subsequent year. Monitoring should distinguish inputs, processes, outputs, and outcomes. Inputs include assigned staff, training provision, approved data standards, and available system and security resources, documented through staffing, training, and administrative records. Processes include the frequency of validation, resolution time for anomalies, access-log review, and the use of dashboard information in review meetings, documented through workflow logs, audit records, and meeting minutes. Outputs include the share of registered objects with complete required fields and coordinates, the number of priority objects validated, resolved anomalies, and operational dashboard reports, drawn from the PBB-P2 register and SiBUNGO records. Outcomes include changes in verified database quality, service performance, payment patterns, and arrears, assessed using comparable administrative series and interpreted alongside external influences. No numerical improvement target should be assigned until Bapenda establishes indicator definitions, denominators, and a credible baseline.

To ensure that the five strategies can be implemented realistically, a roadmap with clear phases is required. A roadmap is important so that the burden of change is not imposed at once on the application, its operators, or the organisation. This is in line with the ETPD mechanism, which positions the roadmap as the basis for preparing an action plan and requires that the action plan contain activities and business processes to achieve targets within a specified year.(Peraturan Menteri Dalam Negeri Nomor 56 Tahun 2021 Tentang Tim Percepatan Dan Perluasan Digitalisasi Daerah Provinsi Dan Kabupaten/Kota Serta Tata Cara Implementasi Elektronifikasi Transaksi Pemerintah Daerah, 2021) At the regency and municipal level, TP2DD is also assigned to develop roadmaps and action plans, conduct outreach and education, monitor, evaluate, and report on ETPD implementation.(Peraturan Menteri Dalam Negeri Nomor 56 Tahun 2021 Tentang Tim Percepatan Dan Perluasan Digitalisasi Daerah Provinsi Dan Kabupaten/Kota Serta Tata Cara Implementasi Elektronifikasi Transaksi Pemerintah Daerah, 2021) SiBUNGO can be positioned as one of the priority agendas within this framework, particularly in relation to the digitalisation of revenue collection and the strengthening of regional-revenue data governance.

Table 1. Roadmap for Strengthening Integrated PBB-P2 Data Governance Based on SiBUNGO

| Phase and period                          | Lead; supporting actors                                                               | Priority actions and measurable indicators                                                                                                                                                               | Minimum gateway to next phase                                                                                                                                                                                    | Key dependency and principal risk                                                                                     |
|-------------------------------------------|---------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|
| I. Foundational consolidation, months 0–6 | Bapenda; Diskominfo and relevant subdistrict/village units                            | Approve data dictionary, assign data owners, map workflows, audit a defined baseline sample; record completeness, duplicates, coordinate coverage, staff readiness, and security inventory               | Standards and SOPs formally approved; baseline and validation scope documented; responsible officers designated; access roles and initial security procedures approved                                           | Dependence: access to existing records and management commitment. Risk: inconsistent legacy data or unclear ownership |
| II. Limited implementation, months 6–12   | Bapenda; Diskominfo, selected territorial units, and other agencies only where lawful | Validate priority objects; train designated staff; pilot dashboard; test only authorised data exchange; record validation coverage, training completion, access-log review, and documented dashboard use | Priority-area validation results reviewed; trained staff assigned; exchange arrangements legally and technically approved before activation; initial dashboard used in at least one documented management review | Dependence: Phase I baseline and approvals. Risk: premature integration, weak uptake, or unauthorised access          |

| Phase and period                                       | Lead; supporting actors                                  | Priority actions and measurable indicators                                                                                                                        | Minimum gateway to next phase                                                                                                                    | Key dependency and principal risk                                                                                                             |
|--------------------------------------------------------|----------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| III.<br>Institutionalisation and evaluation, years 1–2 | Bapenda; TP2DD, Diskominfo, and authorised partner units | Expand validated coverage; review data quality, service performance, and safeguards; incorporate findings in planning; record trend series and corrective actions | Continuing review cycle documented; data-quality and security findings acted on; indicators incorporated into planning and performance reporting | Dependence: stable workflows and comparable series. Risk: resource discontinuity or treating revenue change as solely attributable to SiBUNGO |

Source: Author's proposed policy roadmap based on the document analysis; phases and gateways are prospective, not reported implementation milestones.

The implementation of this roadmap requires monitoring and evaluation indicators that do not focus exclusively on revenue figures. Indicators in the initial phase should assess governance readiness, including the availability of data standards, the number and quality of SOPs, the proportion of officers who have received training, and the availability of dashboards. Process indicators may measure the coverage of verified or updated objects, the number of addressed data anomalies, service-completion speed, and the regularity of data updates. Outcome indicators may then assess improvements in database accuracy, increased use of digital services, the use of data in planning meetings, PBB-P2 realisation patterns, and developments in arrears. Such a phased framework prevents evaluation from incorrectly attributing all changes in revenue to the application, because PBB-P2 revenue is also influenced by economic conditions, taxpayer compliance, tariff policies, collection quality, and other external factors. The framework confirms the value attributed in prior studies to GIS-assisted object identification and collaboration in PBB-P2 data collection (Balogun, 2019; Nisa & Tamrin, 2025). It extends that discussion in a different direction: rather than testing whether an established application improves efficiency or revenue, it specifies the standards, allocation of responsibility, lawful exchange conditions, decision-use indicators, and phase gates needed to govern a newly introduced system. This is a conceptual and policy-design extension, not evidence that the proposed arrangements have already improved administration in Mandailing Natal

Through these strategies and the proposed roadmap, SiBUNGO can be directed as a policy instrument integrating the dimensions of data, technology, organisation, and decision-making. This direction is more sustainable than merely expanding digital features because it makes the success of innovation dependent on local government's capacity to establish trustworthy data, consistent business processes, accountable coordination, and the use of information for revenue planning. Accordingly, the optimisation of PBB-P2 should not be positioned solely as a short-term revenue target, but rather as an outcome of strengthening data-driven regional-revenue governance that is implemented progressively, securely, and subject to evaluation.

## Conclusion

This desk-based analysis finds that the documented introduction and reported service functions of SiBUNGO create a policy opportunity, but do not establish improvements in PBB-P2 data quality, compliance, or revenue. The article's contribution is a prospective governance framework connecting data standards and updating, administrative workflows, lawful interoperability, institutional capacity, and decision-oriented data use to a qualitative policy choice and phased implementation roadmap. Integrated data governance is preferred as a strategic direction, conditional on a verified baseline, clear responsibilities, security safeguards, and periodic review. Because the analysis relies on secondary material and SiBUNGO is at an early stage, the proposed framework has not been tested against internal administrative records or implementation experience. Future research should examine validated-object and mapping coverage, data-quality changes, service and payment records, staff practices, and comparable PBB-P2 revenue and arrears series without attributing observed fiscal changes to the application alone.

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