Policy reformulation of geospatial information services through a territorial approach

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Abstract

This study evaluates the implementation of Indonesia's Thematic Geospatial Information (TGI) service policy under Ministerial Regulation ATR/BPN No. 1/2023 (Arts. 39–40). It diagnoses operational gaps—unclear management mechanisms, the absence of formal service-request procedures, overlapping unit mandates, and delivery limited to visualization on the Bhumi geoportal. The research pursues three aims: (i) assess TGI service quality and operability; (ii) map stakeholder roles and interrelationships; and (iii) formulate a territorial, region-based model to operationalize publication–interaction–collaboration. A mixed approach integrates SERVQUAL for validated service-quality evaluation, MACTOR for stakeholder analysis, and a policy path–gap analysis, verified through interviews and focus group discussions and complemented by benchmarking. Findings reveal six strategic regulatory issues, a convergence–divergence map of actor interests, and a reformulation model that sharpens procedures, clarifies mandates, and introduces regional typologies to manage service complexity. The study also proposes a non-tax state revenue (PNBP) financing option within a New Public Governance paradigm—co-creation, co-production, and co-delivery. The results imply stronger legal certainty, more effective cross-actor collaborative governance, and enhanced TGI service quality to support land affairs and spatial-planning decision-making.

Keywords: MACTOR, New Public Governance, Policy path–gap analysis, Policy reformulation, SERVQUAL, Thematic Geospatial Information.

1. Introduction

Indonesia's spatial development agenda—encompassing spatial planning, land administration, and transport—requires geospatial information (GI) services that are reliable, standardized, and readily accessible across actors. Following the

NSDI initiative and Law No. 4/2011, policy instruments such as the One Map and One Data initiatives have accelerated interagency data integration. In the land and spatial domains, Ministerial Regulation ATR/BPN No. 1/2023 specifies themes, standards, and implementation stages for GI services. Yet, current Thematic Geospatial Information (TGI) service delivery remains largely confined to "view-only" data provision via the Bhumi geoportal, leaving a gap between regulatory mandates—publication, interaction, and collaboration—and users' actual service experience [1-4].

Epistemically, sound public decision-making depends on the transformation from data to information to knowledge, as articulated in the DIKW hierarchy [5]. To minimize bias and ensure responsiveness and inclusion, policy evaluation should be designed as a systematic process within the formal evaluation tradition Dunn [6]. Rowley [5];Dunn, et al. [7].

From a governance perspective, New Public Governance (NPG) positions government as the orchestrator of collaborative networks rather than the sole service provider. Co-production, co-delivery, and co-creation [8, 9];operate as mechanisms for cross-actor collaboration. To broaden stakeholder participation and accelerate policy innovation, helix models have evolved from the Triple Helix (government–industry–academia) to the Quadruple Helix (adding civil society) and the Penta Helix (adding media), strengthening dissemination, transparency, and accountability Ranga and Etzkowitz [10];Carayannis and Campbell [11] and Muhyi, et al. [12]. Osborne [8];Osborne, et al. [9]; Ranga and Etzkowitz [10];Carayannis and Campbell [11] and Muhyi, et al. [12].

Analytically, this study combines MACTOR-based actor mapping to assess power relations and the convergence–divergence of stakeholder objectives [13-16] to generate strategic recommendations [13-16] Service quality is evaluated using SERVQUAL to identify gaps across the dimensions of tangibles, reliability, responsiveness, assurance, and empathy [17, 18], complemented by benchmarking as a systematic, cyclical process of absorbing cross-sector best practices beyond simple comparative studies [17-20].

Furthermore, Policy Path–Gap Analysis is employed to trace implementation trajectories, identify stage-specific bottlenecks, and formulate adaptive workflow improvements. This approach is pertinent to administrative reform and public service transformation, while remaining alert to participation bias; accordingly, it is coupled with adequate qualitative and quantitative evidence [4, 21-23].

Finally, to ensure spatial relevance and service equity, the reform design is operationalized through territorial diversification (urban, peri-urban, rural) using economic–physical–social indicators derived from GIS-based analysis [24-26].

By integrating the DIKW and formal evaluation frames; collaborative governance under NPG and the Penta Helix; MACTOR; SERVQUAL with benchmarking; and Policy Path–Gap Analysis with territorial diversification, this study targets an operational, inclusive, and equitable reformulation of ATR/BPN's TGI services—bridging the gap between policy norms and on-the-ground service performance.

2. Literature Review

2.1. Public Policy Reformulation

Public policy reformulation entails the evaluation, improvement, and reconstruction of existing policies to ensure greater adaptability, effectiveness, and alignment with contemporary social, economic, and technological demands [27]. In geospatial information (GI) services, reformulation is especially salient given increasingly complex public needs and the rapid evolution of geospatial technologies [28].

Policyreformulation is often situated within the policy cycle—problem definition, implementation, evaluation, and potential termination [7]. In this study, reformulation goes beyond textual adjustments to policy substance; it emphasizes cross-actor alignment and the enhancement of spatial data–driven public services that are responsive to territorial needs [8].

2.2. Public Policy Analysis: Benchmarking and SERVQUAL

This study employs two analytical frames: benchmarking and the SERVQUAL model.

Benchmarking is treated as a systematic strategy for identifying performance gaps, learning from international best practices, and adapting them to national contexts [20]. A pertinent example is the Singapore Land Authority's integration of geospatial technologies to support the Smart Nation agenda, which offers a relevant reference point for Indonesia [29].

The SERVQUAL model introduced by Parasuraman, et al. [18] and Parasuraman, et al. [17] is used to evaluate public service quality across five dimensions: tangibles, reliability, responsiveness, assurance, and empathy. By capturing discrepancies between user expectations and perceptions, SERVQUAL provides a robust basis for policies oriented toward citizen satisfaction [30].
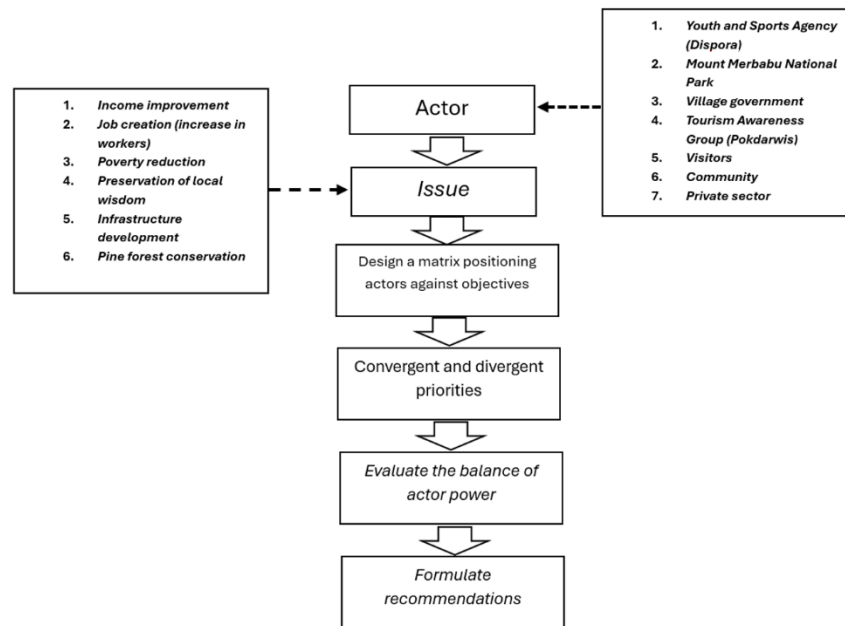
Figure 1.
SERVQUAL Concept.
Source: Parasuraman, et al. [18]

In applying SERVQUAL, we focus on the gap between expectations and perceived performance in public services. This choice rests on several considerations. First, the core purpose of public services is to deliver user satisfaction; accordingly, quality assessment should center on user experience and needs. In this regard, SERVQUAL's Gap 5 directly reflects the discrepancy between user expectations and actual service experiences, making it a relevant indicator for assessing public service delivery quality.

2.3. Stakeholder Roles and Helix Concepts

Contemporary public service governance requires multi-actor participation framed by the helix concepts. The Triple Helix (government–industry–academia) positions cross-sector collaboration as a driver of policy innovation [31]. The framework has evolved into the Quadruple Helix by adding civil society and the Penta Helix by incorporating media as a catalyst for transparency [11, 32].

In GI service provision, helix approaches help ensure that policy reformulation is not purely top-down; they open pathways for co-creation, co-production, and co-delivery [9]. Early and sustained stakeholder engagement—from formulation through implementation—can enhance the legitimacy and effectiveness of public services.

The MACTOR method (Matrix of Alliances and Conflicts: Tactics, Objectives, and Recommendations), developed by [14], is employed to map stakeholder positions, influence, and interests, yielding convergence–divergence maps that are critical for designing balanced multi-helix collaboration strategies [33].
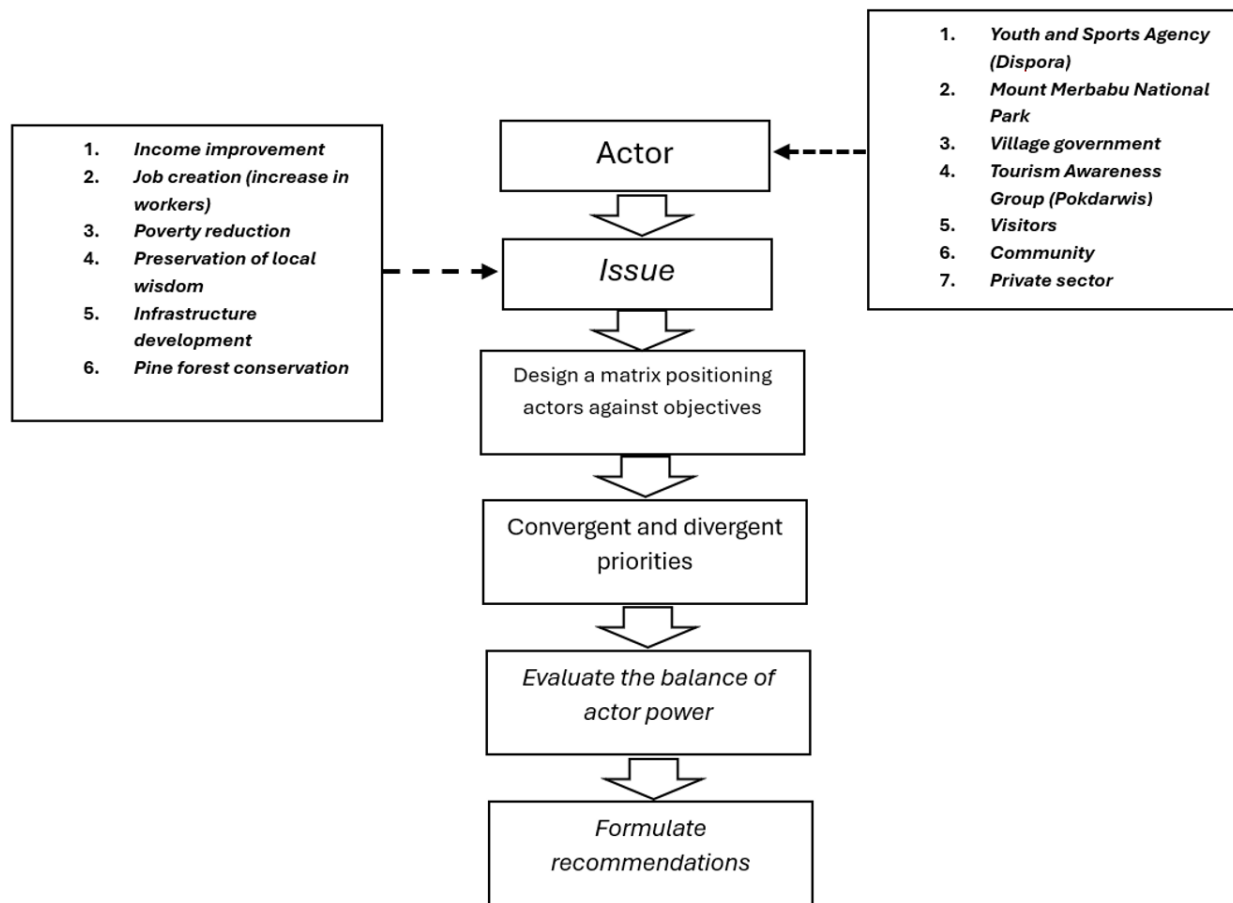
Figure 2.
MACTOR Method Conceptualization.

2.4. The New Public Governance (NPG) Paradigm

The NPG paradigm supersedes the hierarchical, bureaucratic logic of Old Public Administration by emphasizing collaboration, networks, and public participation in service delivery [8]. In GI services, NPG recasts government as an enabler rather than a sole provider, facilitating cross-sector interaction to create public value [34]. NPG's principles align with demands for data openness, service digitalization, and cross-agency information system integration—prerequisites for GI services that are both high quality and inclusive [35].

2.5. Co-Production, Co-Creation, and Co-Delivery

Co-production views citizens not merely as recipients but as active partners in the design and delivery of public services [36]. Implementation typically takes two forms:
- Co-creation: engaging communities in policy formulation and service design to ensure alignment with local needs;
- Co-delivery: enabling government, private sector, and communities to collaborate in implementation [30].

Both concepts are highly relevant to reformulating GI service policy, which requires strong responsiveness to heterogeneous territorial needs.

2.6. Policy Path–Gap Analysis

Policy Path–Gap Analysis is used to identify discrepancies between policy design and implementation practice [21]. It helps pinpoint critical junctures where policies deviate from plan, thereby informing more targeted corrective recommendations [4]. In this study, the path–gap approach is integrated with a territorial lens to ensure that reformulation accounts for interregional variation in infrastructure capacity, resources, and service needs [24, 37].

Figure 3.
Policy Path–Gap Analysis.
Source: Putra [4]
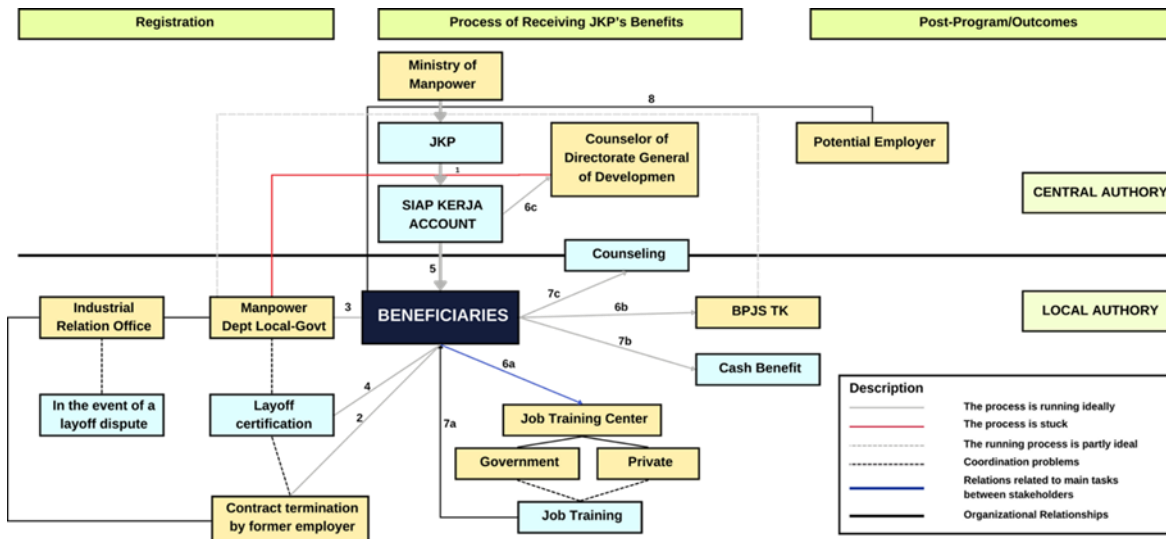
2.7. Geospatial Information and Public Service Provision

Geospatial information (GI) is defined as spatially attributed data representing phenomena on the Earth's surface, used to support decision-making [1]. In Indonesia, the GI regulatory framework is established by Law No. 4/2011 and Ministerial Regulation ATR/BPN No. 1/2023, which mandate standardized, open, and cross-sector–accessible GI services [38].

However, implementation remains challenged by data fragmentation, limited interoperability, and uneven service quality across regions [39]. A reformulation model is therefore needed to unify technical standards, strengthen multi-actor collaboration, and ensure equitable service access nationwide.

2.8. Regional Development Theories and Spatial Justice

Territorialized public service delivery should heed center–periphery [40] and polarization [37] theories, which explain development disparities between cores and peripheries. Complementary scholarship foregrounds spatial justice—the equitable distribution of public services across space—as a prerequisite for sustainable development [41, 42].

In GI services, spatial justice ensures that remote areas with infrastructural constraints receive access to high-quality data and services on par with more advanced urban regions [24].

3. Research Methodology

3.1. Research Design and Approach

This study adopts an explanatory sequential mixed-methods design to formulate a reformulation of Thematic Geospatial Information (TGI) service policy within the Ministry of Agrarian Affairs and Spatial Planning/National Land Agency (ATR/BPN) through a territorial lens. The design first gathers quantitative evidence using the SERVQUAL instrument [17] and then deepens interpretation via qualitative techniques—semi-structured interviews and focus group discussions (FGDs). This strategy enables the systematic explanation of how user perceptions relate to policy structures and stakeholder engagement in the design of TGI service policy.

3.2. Research Focus and Setting

The research focuses on: (i) the operability of the current TGI service policy; (ii) the role of helix stakeholders in policy reformulation; and (iii) the development of a new policy model grounded in territorial typologies. The empirical setting includes ATR/BPN units that provide TGI services and service users across region classes characterized as urban, semi-urban, and rural.

3.3. Data Sources and Types

Primary and secondary data are used. Primary data comprise user perception surveys employing SERVQUAL across the five dimensions—tangibles, reliability, responsiveness, assurance, and empathy [17]—and qualitative materials from semi-structured interviews and FGDs with government, academia, private sector, and civil society actors. Secondary data include regulatory documents, internal ministerial reports, and international benchmarking documentation.

Table 1.
Data Sources and Types.

No.	Data Type	Source
1	Quantitative	SERVQUAL questionnaires administered to TGI service users
2	Qualitative	Semi-structured interviews and FGDs with stakeholders
3	Secondary Docs	Ministerial Reg. ATR/BPN No. 1/2023; Gov. Reg. No. 128/2015; case studies abroad

3.4. Data Collection Procedures

Data collection proceeded in two stages. First, questionnaires were distributed to TGI users across region classes using stratified sampling. Initial analysis applied SERVQUAL to identify service gaps. Second, qualitative work comprised semi-structured interviews with key stakeholders within ATR/BPN and external partners, followed by cross-helix FGDs to map actors, interests, influence, and existing/potential collaboration mechanisms.
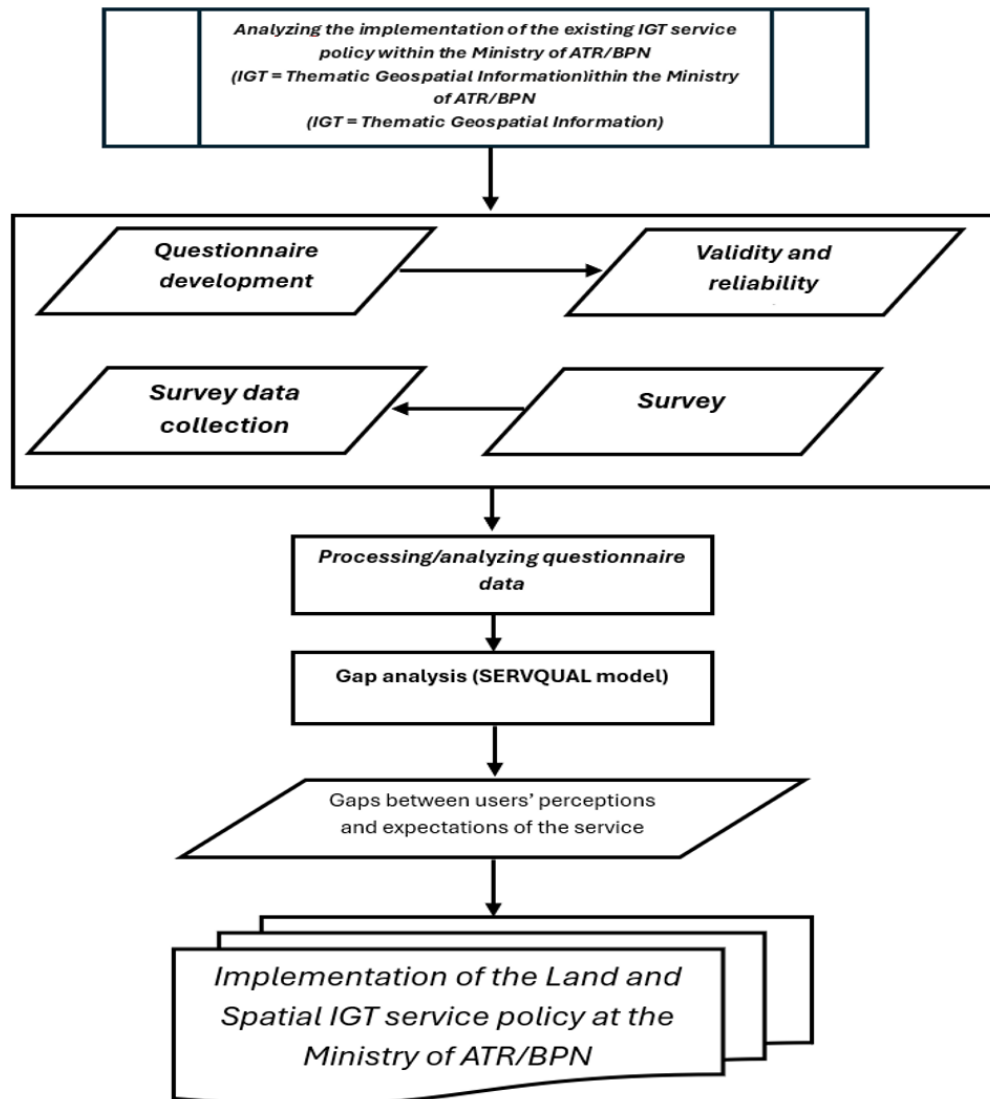
Figure 4.
Policy Implementation Analysis Flow.

A flow diagram depicting the evaluation of existing policy, integrating SERVQUAL inputs and Path–Gap Analysis.

Figure 5.
Workflow for Defining Stakeholder Roles.
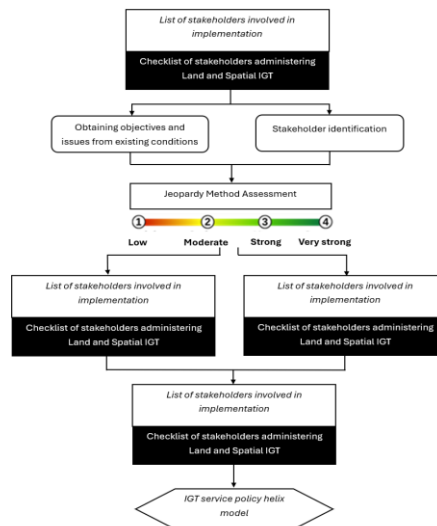
A visualization of the process for identifying and categorizing actor roles in helix-based policy reformulation.

3.5. Analytical Framework and Techniques

The analytical framework integrates Policy Path–Gap Analysis [27] to identify discrepancies between ideal policy design and implementation realities, with MACTOR [33] to map actor power and interests. The combined analysis produces a stakeholder map that informs policy reformulation.

Quantitative data are analyzed using descriptive statistics and SERVQUAL gap scores. Instrument validity is examined through construct validity, and reliability through Cronbach's alpha. Qualitative data are analyzed via thematic coding and narrative analysis, with emphasis on helix dynamics [32, 43] and the alignment of policy with territorial diversity.

3.6. Theoretical Integration

Four theoretical pillars guide the study: (i) New Public Governance [8], emphasizing multi-actor collaboration in public service; (ii) co-production, co-creation, and co-delivery [35, 36], supporting active participation by citizens and non-state actors in policy design and implementation; (iii) Path–Gap Analysis to diagnose stage-wise discontinuities as a basis for reformulation; and (iv) the expanded helix models (quadruple and quintuple) to structure interactions and contributions within the geospatial policy ecosystem.

3.7. Ethics and Validity

The study adheres to established ethical principles, including informed consent, data confidentiality, and transparency of research aims. Triangulation strengthens validity by integrating evidence from three primary sources—documents, surveys, and interviews—to ensure accuracy and consistency of findings.

4. Results and Discussion

4.1. Policy Operability of TGI Services: SERVQUAL Analysis

The operability of Thematic Geospatial Information (TGI) service policy was assessed using SERVQUAL, which measures gaps between users' expectations and perceptions across five dimensions—tangibles, reliability, responsiveness, assurance, and empathy [17]. The survey instrument comprised 24 items for both perceptions and expectations. The difference between the two yields a gap score, used here as an indicator of actual service quality.

Table 2.
SERVQUAL Analysis of TGI Service Quality.

No.	Item	Mean Perception	Mean Expectation	Gap (P–Q)	Classification	Service Quality
1	The technology used in TGI services is up to date and adequate.	4.46	4.24	0.22	Moderate	Good
2	The TGI service portal is accessible on multiple devices (mobile, laptop, desktop), easy to understand and use, loads quickly, and performs well.	4.46	4.08	0.38	Moderate	Good
3	Physical facilities and infrastructure supporting the service are adequate.	4.50	4.02	0.48	Moderate	Good
4	Service officers are neat and well-groomed.	4.52	4.10	0.42	Moderate	Good
5	User guides/FAQs are available, and a chatbot or customer service is provided.	4.34	3.98	0.36	Moderate	Good
6	Pamphlets or flowcharts explain how to use the service and the requirements users must fulfill.	4.30	4.20	0.10	Moderate	Good
7	When ATR/BPN commits to a service time, it actually delivers at that time.	4.64	4.06	0.58	Moderate	Good
8	Service officers are sincerely willing to help and inspire confidence.	4.50	4.02	0.48	Moderate	Good
9	ATR/BPN can be relied upon to fulfill requested services.	4.48	4.02	0.46	Moderate	Good
10	Services are completed within the time promised by ATR/BPN.	4.50	4.04	0.46	Moderate	Good
11	ATR/BPN keeps accurate records of service requests.	4.44	3.94	0.50	Moderate	Good
12	ATR/BPN consistently informs users exactly when services will be performed.	4.52	4.02	0.50	Moderate	Good
13	Service officers deliver services quickly, effectively, and efficiently.	4.52	4.14	0.38	Moderate	Good
14	Service officers are always willing to assist users.	4.52	4.12	0.40	Moderate	Good
15	Service officers respond quickly to user requests and resolve problems.	4.50	3.90	0.60	Moderate	Good
16	Users can trust the service officers.	4.56	4.04	0.52	Moderate	Good
17	Users feel safe when transacting with service officers.	4.62	4.02	0.60	Moderate	Good
18	Service officers are consistently polite.	4.54	3.92	0.62	Moderate	Good
19	Service officers possess the knowledge and skills needed to provide optimal service.	4.48	4.06	0.42	Moderate	Good
20	ATR/BPN can provide personalized services tailored to individual user issues.	4.40	3.92	0.48	Moderate	Good
21	Service officers can provide personal attention to users.	4.34	3.94	0.40	Moderate	Good
22	Service officers understand user needs well.	4.52	3.82	0.70	Moderate	Good
23	ATR/BPN prioritizes users' interests.	4.36	3.96	0.40	Moderate	Good
24	ATR/BPN operating hours are appropriate for user needs.	4.54	3.92	0.62	Moderate	Good

Average gap: 0.45 → Classification: Moderate → Service quality: Good

Interpretation. Table 2 indicates that responsiveness and reliability exhibit the largest (negative) gaps, signaling lower user satisfaction with service speed and consistency. This corroborates earlier indications that TGI services remain largely one-way with limited user interaction.

4.2. Regulatory Barriers and Service Fragmentation

Ministerial Regulation ATR/BPN No. 1/2023 provides the operational basis for TGI services. However, implementation remains suboptimal for three main reasons: (1) the absence of technical mechanisms for inter-unit collaboration; (2) overlapping mandates among implementing units, as noted in Articles 10 and 40; and (3) public TGI services are offered primarily as view-only portals without meaningful interaction or collaboration features.

4.3. Path–Gap Analysis and Identification of Critical Pathways

To evaluate implementation, this study applies Policy Path–Gap Analysis [4]. The model delineates an ideal implementation path within the Process of Service Management (PLM), then assesses real-world operability using a three-color scheme: black (operates ideally), yellow (operates but suboptimally), and red (not operating).
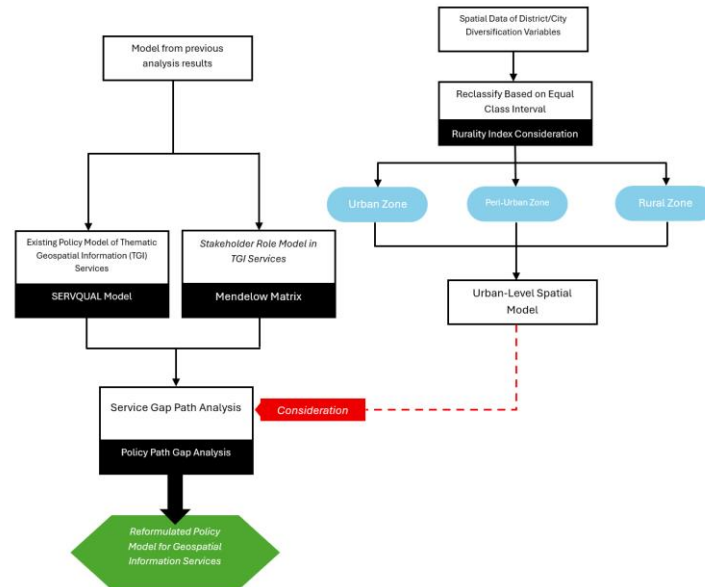

Figure 6.
Workflow for Developing the TGI Service Policy Reformulation Model.

The diagram visualizes the path–gap logic underpinning the classification of policy requirements into high, medium, and low criticality. For example, the pathway "dissemination of TGI by the Managing Unit" is coded red due to the absence of clear operational foundations. Reformulation efforts prioritize red and yellow pathways for targeted intervention.

4.4. Territorial Diversification and Service Complexity

From a spatial justice perspective, the model differentiates territorial classes—urban, semi-urban, rural—using a regional diversification approach [24]. Three indicator sets—economic, social, and physical—inform a territory-based TGI service needs matrix, analyzed using GIS overlays and spatial scoring.
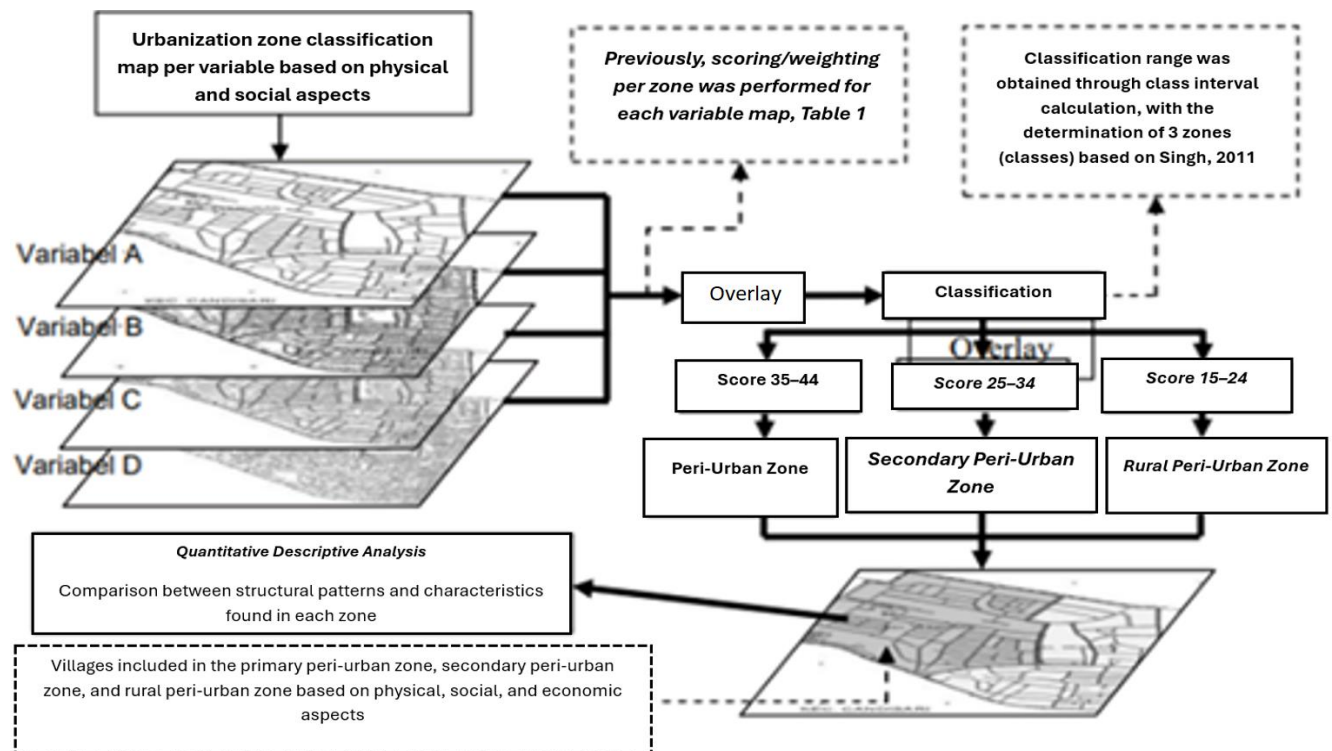

Figure 7.
Analysis of Regional Class Diversification.
Source: Kurnianingsih [24]

The spatial analysis underpins a differentiated service policy. Findings suggest that rural regions require more open data access and technical training, whereas urban areas prioritize integration with local government digital systems.

4.5. Stakeholder Roles and the Helix Approach

FGD results indicate that policy reformulation for TGI services is not yet supported by robust cross-actor coordination structures. A quadruple helix lens [32] was used to map positions and interests (government, private sector, academia, civil society). Using MACTOR, stakeholders were classified by power and interest, producing a stakeholder interest map to guide reformulation.

Table 3.
Stakeholder Involvement in Formulating TGI Service Policy.

Code	Institution	Institutional Role	Strategic Objective
A1	Secretariat General (Bureau of Organization & Procedures), ATR/BPN	Cross-unit policy coordination and budget management	Increase efficiency of geospatial data–driven policy implementation
A2	Center for Land and Spatial Data & Information, ATR/BPN	Central data management and service integration	Provide standardized, accessible thematic GI services
A3	DG of Land and Spatial Surveying & Mapping, ATR/BPN	Technical execution of thematic surveying and mapping	Supply accurate, up-to-date thematic geospatial databases
A4	North Jakarta Land Office, ATR/BPN	Service delivery and data provision at regional level	Deliver geospatial services tailored to urban needs
A5	Central Jakarta Land Office, ATR/BPN	Service delivery and data provision at regional level	Deliver geospatial services tailored to urban needs
A6	ATR/BPN Jakarta Provincial Office	Oversight and operational control of district land offices	Ensure integrated IGT services across districts/cities within the province
A7	Directorate General of Spatial Planning, ATR/BPN	Formulation and execution of technical spatial-planning policy	Achieve integrated, synchronized land–spatial policies using thematic GI for planning, permitting, and spatial control
A8	Directorate of Non-Tax State Revenue (PNBP), Ministry of Finance	Tariff-setting and service monetization regulations	Sustain geospatial services through PNBP-based financing
A9	Directorate of Regulatory Harmonization III, Ministry of Law	Legal coordination and ratification of technical regulations	Ensure legal certainty and cross-policy coherence
A10	Geospatial Information Agency (BIG), Thematic Mapping Division	Provider of foundational geospatial data (IGD)	Align TGI with the national geospatial information system
A11	Provincial Government of Jakarta	High-complexity regional implementation	Develop services for digital urban needs
A12	Semarang City Government	Digital city pilot with WebGIS	Accelerate WebGIS integration and thematic land data openness
A13	Batam Government	—	Tailor services to local thematic needs (e.g., mining land)
A14	East Belitung Regency Government	3T area with limited HR and infrastructure	Ensure inclusive access to geospatial services
A15	Wonogiri Regency Government	Conservation and agricultural area	Enhance use of TGI for disaster mitigation and land management
A16	Diponegoro University	Research on geospatial public service policy	Provide scientific basis and data-driven policy evaluation
A17	Gadjah Mada University	Expertise in geospatial and spatial planning	Strengthen technical capacity and academic recommendations
A18	Bandung Institute of Technology	Geospatial technology innovation	Develop system and AI innovations for TGI services
A19	ID Survey	Survey and mapping services provider	Support accelerated updating of thematic data

A20	PT Bhumi Varta Technology	AI/IoT-based geospatial solutions	Integrate TGI services with intelligent computing technologies
A21	Geosquare	Dashboard and thematic map consultancy	Advance visualization and user experience for public services
A22	Indonesian Association of Planners (IAP)	Advocacy for data-driven planning	Promote use of thematic data in spatial planning
A23	Indonesian Surveyors Association	Technical standardization of surveying and mapping	Improve quality and accuracy of survey outputs
A24	MAPIN (Indonesian Society for Remote Sensing)	Professional geospatial association	Uphold competence and professional ethics in TGI technical work
A25	*Republika* News	Public information dissemination	Improve public understanding of TGI

Note: Stakeholder involvement remains low among civil society and the private sector, running counter to co-creation principles under New Public Governance Osborne [8]. Institutional interventions are therefore needed to open collaboration spaces.

4.6. Policy Reformulation: Integrating Theory and Practice

Synthesizing quantitative (SERVQUAL) findings, process evaluation (path–gap), and actor analysis (helix), this study proposes a Territory- and Collaboration-Based TGI Service Policy Reformulation Model. Key recommendations include:

- Technical regulations for TGI service delivery tailored to territorial typologies (rural, urban);
- Co-production and co-delivery mechanisms embedded in service operations;
- Revitalization of the TGI Service Managing Unit with clarified mandates and updated performance indicators;
- Strengthened PNBP-based monetization of TGI services in line with Government Regulation No. 128 of 2015.

Taken together, the reformulation is expected to enhance service quality while supporting fiscal efficiency and the sustainability of data-driven programs. In line with NPG objectives and inclusive public service principles (Brandsen et al., 2018), the model offers an adaptive, collaborative, and spatially grounded policy direction.

5. Conclusion

This study affirms that reformulating the Ministry of ATR/BPN's Thematic Geospatial Information (TGI) service policy must be evidence-based and purposefully directed to bridge the gap between regulatory design and operational realities. While Ministerial Regulation ATR/BPN No. 1/2023 provides a general framework for production–management–dissemination, it leaves technical gaps in service mechanisms, clarity over implementing actors, and rules for collaboration—creating ambiguity in field implementation. The proposed reform takes an incremental approach: detailing Article 39 on service mechanisms; refining Article 40(2)–(4) so that publication, interaction, and collaboration become genuinely functional; and specifying the implementing unit in Article 40(5) to align with the managing unit's mandate.

From the literature, New Public Governance—operationalized through co-creation, co-production, and co-delivery—and helix approaches provide a conceptual justification for shifting the service paradigm from "provider–user" to "collaborative partners." The study's novelty lies in coupling these perspectives with path–gap analysis to close policy discontinuities and in differentiating territorial typologies (urban/peri-urban/rural) so that service standards are sensitive to spatial context and regional capacity.

Methodologically, the study integrates quantitative evaluation (SERVQUAL) with qualitative analytical design (path–gap analysis and stakeholder mapping) to yield operational policy recommendations. SERVQUAL quantifies the gap between perceived performance and expectations across five dimensions—tangibles, reliability, responsiveness, assurance, empathy—as a diagnostic of existing service quality. Results indicate an overall "good" quality with moderate classification, but the largest shortfall appears in empathy: the item "officers understand user needs well" records the highest gap (0.70). This signals that the deepest improvements should target service personalization and sensitivity, rather than focusing solely on systems or infrastructure.

Benchmarking against Singapore (OneMap/GeoSpace) underscores that geospatial service success depends not only on data completeness but also on responsiveness, openness, and cross-agency interoperability. Building on these lessons, the study formulates nine strategic issues to guide reformulation: improving non-physical quality (responsiveness/assurance/empathy); enhancing data openness and access via geoportals; achieving system integration and synchronization; ensuring inclusivity for 3T regions; leveraging AI and interactive interfaces; strengthening multi-stakeholder collaboration; securing sustainability through PNBP; standardizing and clarifying regulations; and reinforcing data-driven evaluation instruments. These issues connect threads from the introduction (policy problems), literature (NPG–helix–SERVQUAL–path gap), methods (mixed design), and results (identified gaps and cross-national learning).

Accordingly, the core recommendations are to:

1. Detail end-to-end SOPs for TGI services (request, validation, delivery, tracking, feedback) as direct derivatives of Articles 39–40;

2. Institutionalize a helix collaboration model (government–business–academia–community) measured through power/interest role matrices;
3. Adopt recurring path–gap analysis as a policy quality-assurance mechanism (periodic review); and
4. Tier service standards by territorial typology, such that empathy/responsiveness targets vary by regional class while meeting a national minimum.

Taken together, this policy package converts the rhetoric of transformation into measurable operational change. The study's scientific contribution is the integration of collaborative governance, service quality evaluation, and spatial justice into an implementable TGI policy design. Its practical contribution is a reform roadmap that can be promptly translated into technical regulations and managerial instruments, enabling ATR/BPN's TGI services to become more responsive, inclusive, interoperable, and fiscally sustainable—without losing their orientation toward public value.

6. Recommendations
Building on the findings and conclusions, the following actions are recommended:
1. Issue Technical Guidelines for TGI Services.
   The Ministry of ATR/BPN should promptly develop detailed technical guidelines for Thematic Geospatial Information (TGI) services that specify the end-to-end workflow—from request intake and validation through delivery, tracking, and feedback—in direct alignment with Articles 39–40 of Ministerial Regulation ATR/BPN No. 1/2023. This step is essential to resolve operational ambiguities that undermine service effectiveness, as evidenced by SERVQUAL gap analysis and field observations.
2. Institutionalize New Public Governance and Multi-Helix Collaboration.
   Establish a standing, cross-sector collaboration forum that is not merely consultative but actively engaged in policy design and evaluation. To ensure effective collaboration, adopt stakeholder mapping using a power–interest matrix to structure authority, responsibilities, and accountability across actors.
3. Enhance Responsiveness and Empathy through Technology.
   Optimize interactive geoportals, artificial intelligence (AI), and user-feedback mechanisms to improve responsiveness and empathy, with targeted features to reach users in 3T regions (underdeveloped, frontier, and outermost areas). Continue systematic benchmarking—e.g., with Singapore's practice—through policy learning and cross-unit capacity building.
4. Adopt Recurring Path–Gap Analysis for Policy Assurance.
   Integrate path–gap analysis as a cyclical evaluation instrument to keep policies adaptive to evolving public needs and advances in geospatial technologies, ensuring continuous alignment between regulatory design and operational performance.

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