Geospatial Data Integration for Enhanced Local Governance: A Case Study of Bogor and Bekasi Regencies

Sultan Aziz Barai[1], Marimin Marimin[2], Yuli Suharnoto[3], Ghazi Oktavidi Muslim[4], Wiske Chriesti Rotinsulu[5], Hengki D. Walangitan[6], Frangky Jessy Paat[7], Elisa Ika Yuniawati[8], Fauzan Noviandy Muslim[9], Ghina Husni Fahira[10], Nabila Kalsum Tuanany[11]

[1] Bogor Agricultural University, Graduate School of IPB, Department of Natural Resources & Environmental Management Science, NREMS Secretariat Postgraduate School Building Floor II IPB Campus Baranangsiang, Bogor, Indonesia, 16144

[2] Bogor Agricultural University, Department of Agro-industrial Technology, Faculty of Agricultural Engineering and Technology, Bogor, Indonesia

[3] Bogor Agricultural University, Department of Civil and Environmental Engineering, Faculty of Agricultural Engineering and Technology, Bogor, Indonesia

[4] Central South University, Business School, Department of Applied Economics, Changsha, Hunan, China.

[5,6,7] Sam Ratulangi University, Jl. Kampus Unsrat, Manado, Indonesia 95115

[8] Department of Psychology Science, Tarumanagara University, Jakarta, Indonesia

[9] Padjajaran University, Department of English Literature, St. Purba Endah IV No. 27, Sangkuriang, Cimahi, 4051, Indonesia

[10] Padjadjaran University, Faculty of Geological Engineering, Jl. Ir. Soekarno Km. 21, Jatinangor, Sumedang, 45363, West Java, Indonesia.

[11] Padjadjaran University, Faculty of Geological Engineering, Jl. Ir. Soekarno Km. 21, Jatinangor, Sumedang, 45363, West Java, Indonesia.

Corresponding author
sultanaziz_bari@yahoo.com

Abstract. This study examines the impact of geospatial data integration on enhancing local governance in Indonesia's Bogor and Bekasi regencies under the "One Data, One Map" (ODOM) initiative. The research employs a mixed-methods approach, combining surveys, focus group discussions, and structured interviews with 125 stakeholders. Using the Exponential Comparison Method (ECM) Decision Matrix, the study evaluates critical strategies for improving data integration, including policy reform, stakeholder engagement, decentralization, and capacity building. The findings reveal that dispute resolution experiences significantly influence stakeholders' perceptions of the ODOM program, with notable variations between Bogor and Bekasi regencies. While Bogor benefits from advanced technological infrastructure and effective implementation, Bekasi faces challenges related to resource limitations and data inconsistencies. The ECM analysis identifies policy reform and stakeholder engagement as top priorities for enhancing program effectiveness. This research underscores the importance of

A. Arif et al. (eds.), *Proceedings of the International Conference on Multidisciplinary Studies (ICoMSi 2024)*, Advances in Social Science, Education and Humanities Research 926,
https://doi.org/10.2991/978-2-38476-406-8_12

addressing implementation challenges, fostering collaboration, and aligning geospatial initiatives with broader sustainable development goals. The insights provide actionable recommendations for improving geospatial data integration and its role in supporting equitable and efficient local governance.

Keywords: Geospatial data integration, local governance, dispute resolution, One Data One Map, Bogor, Bekasi.

1 Introduction

Accurate, accessible, and integrated geospatial data is essential for effective regional governance. Such data supports decision-making on critical issues, including resource management, infrastructure development, disaster response, and urban planning. Recognizing this need, the Indonesian government initiated the "One Data, One Map" (ODOM) program. The primary aim of ODOM is to address inconsistencies and accessibility limitations in geospatial data, which often result from decentralized mapping applications (Anantya, 2023). By creating an affordable and integrated geospatial data management system, ODOM seeks to streamline data exchange processes and improve alignment across governmental levels. This initiative represents a significant step forward in making geospatial data more responsive and effective for local governance (Amiludin & Asmawi, 2020).

However, for the ODOM initiative to achieve its full potential, several persistent challenges must be addressed. Issues such as data outages, inconsistencies, and compatibility problems hinder seamless data integration and reduce the program's overall effectiveness. These challenges complicate regional management processes, delaying timely and accurate decision-making (Uitto & Batra, 2022). Disputes over data ownership, jurisdiction, and quality further exacerbate these issues, underscoring the need for robust solutions to enhance data integration efforts. **ODOM's success in fostering thriving local government systems depends heavily on improved data development and the resolution of ongoing issues, including compatibility and standardization challenges (Indonesia Distribution, 2019).**

This research explores the implementation of the ODOM program in Bogor and Bekasi regencies, focusing on its impact on local governance. Specifically, it examines the mechanisms through which ODOM classifies and integrates regional government records and the challenges involved in aligning geospatial data with governance needs. Furthermore, it investigates how solutions to address data inconsistencies and resolve disputes influence stakeholders' perceptions of the program. To explore these dynamics, the study tests the hypothesis:

- **H1.1:** The experience with dispute resolution significantly influences the overall perception of the ODOM program, and this influence varies between Bogor and Bekasi regencies.

By analyzing these dynamics, the research provides insights into the factors shaping the program's effectiveness and its reception among policymakers, operators, and users. Ultimately, this research contributes to a better understanding of how geospatial

data integration initiatives can enhance local governance through improved data management practices. By addressing key challenges such as inconsistencies, compatibility issues, and stakeholder engagement, the findings aim to guide decision-makers in implementing more effective geospatial data strategies, ensuring sustainable and efficient regional development.

2 Literature Review

2.1 Geospatial Data Integration

Geospatial data integration combines information from multiple sources into a unified dataset suitable for spatial analysis. It is critical for applications such as urban planning, disaster management, and resource allocation because it enhances accuracy, improves accessibility, and facilitates the location-specific implementation of policies. By enabling users to access geospatial information in real time, integration plays a vital role in effective local governance. Once geospatial data integration is complete, decision-making processes and the implementation of higher-level policies are significantly enhanced (Letsoin et al., 2018). Despite its benefits, geospatial data integration faces persistent challenges, including inconsistencies in data formats, interoperability issues, and fragmented data-sharing practices. These issues often undermine the utility of geospatial systems, particularly in local governance contexts where timely and accurate data are essential (Yerden & Luna-Reyes, 2021).

2.2 Data Integration Challenges in Geospatial

While geospatial data integration offers numerous advantages, it also presents several challenges. For instance, inconsistencies in automation processes, repetitive spatiality, and differences in data management practices often result in inefficiencies (Bachry, 2019; Wiwin et al., 2020). In Bekasi, flood-prone areas exemplify how local governance systems face additional complexities that geospatial data can help address, particularly in disaster risk management (Agustina, 2021). These inefficiencies can lead to divergent viewpoints, inefficient resource distribution, and mistrust among stakeholders, thereby hindering the effectiveness of local governance initiatives. Furthermore, unresolved disputes over data ownership and jurisdiction exacerbate these issues, making it difficult to achieve cohesive and effective geospatial systems at both regional and national levels.

2.3 Collaborative governance and dispute resolution

To overcome these challenges, a collaborative governance approach is essential. Collaborative governance involves partnerships among government entities, the private sector, and non-governmental organizations to address common challenges. This approach emphasizes shared responsibility and encourages stakeholders to work together to resolve conflicts and improve data integration (Wiwin et al., 2020). Effective conflict resolution mechanisms, such as negotiation, mediation, and arbitration, are critical to

addressing disputes over data ownership and integration. These mechanisms promote trust and transparency, enabling smoother implementation of geospatial initiatives. Additionally, incorporating conflict resolution measures into governance frameworks can reduce tensions and foster collaboration, especially in initiatives like the ODOM program.

2.4 Geospatial data role in achieving SDGs

Geospatial data plays a critical role in monitoring and achieving the United Nations Sustainable Development Goals (SDGs). By integrating geospatial systems with decision-making frameworks, policymakers can evaluate, monitor, and report on SDG indicators more effectively (Astari et al., 2021). This approach ensures that local governments can make informed decisions about resource allocation, urban development, and environmental protection (Guha & Chakrabarti, 2019; Scott & Rajabifard, 2017). In the Indonesian context, geospatial data is instrumental in aligning development initiatives with SDG targets. The integration of ministry-level data with local governance frameworks enables more efficient policy implementation, thereby contributing to sustainable and equitable development.

2.5 The ODOM Initiative in Indonesia

The "One Data, One Map" (ODOM) program represents a significant step forward in Indonesia's efforts to integrate geospatial data at the local government level. By consolidating property records and management systems, the ODOM initiative aims to create a unified platform for geospatial information. This program facilitates more accurate resource management and decision-making processes, thereby enhancing local governance capabilities. However, the initiative faces several challenges, including technical incompatibilities, inconsistent data standards, and disputes over data ownership (Sutanta et al., 2018). Despite these obstacles, ODOM serves as a foundational model for improving geospatial data management in Indonesia, aligning local governance objectives with broader national and global development goals.

2.6 Historical Context and Evolution of Geospatial Systems Context and Evolution

Geospatial data management has evolved significantly over the past several decades, transitioning from manual mapping methods to sophisticated Geographic Information Systems (GIS) and remote sensing technologies. These advancements have improved data storage, processing, and visualization capabilities, enabling better decision-making and governance outcomes (Kraak & Ormeling, 2020). Global initiatives, such as the United Nations' "Data Revolution," highlight the importance of geospatial data in supporting sustainable development and good governance. In Indonesia, the development of the National Spatial Data Infrastructure over the past 25 years has been a crucial step toward improving data integration and utilization. However, obstacles such as fragmented systems, limited resources, and governance challenges persist (Putra et al.,

2019). The ODOM initiative is a significant advancement within this context, representing Indonesia's commitment to modernizing geospatial data systems for sustainable local governance. By leveraging digital mapping technologies and standardized data practices, the program aims to address long-standing challenges and unlock the full potential of geospatial systems.

2.7 Gaps in Current Research

To identify research gaps related to geospatial data integration and local governance in Bogor and Bekasi regencies, VOS viewer analysis was conducted using the keywords: geospatial data integration, local governance, dispute resolution, One Data One Map, Bogor, Bekasi, Indonesia, and "geospatial data integration" AND "local governance" AND "Indonesia". The Publish or Perish application was used to extract 500 indexed articles from Scopus, which were analyzed using VOS viewer. The key findings and insights from this analysis are detailed below:

a. Overview of Research Themes: The VOS viewer analysis highlights several interrelated themes related to geospatial data integration for enhanced local governance:

- Primary Areas of Interest*:* The terms "regency," "Bogor," and "Bekasi" regencies are prominently associated with "map," indicating the focus of recent studies on spatial data's role in local governance at the regency level.
- Opportunities and challenges: Frequent co-occurrence of terms such as "challenge," "implementation," and "decentralization" underscores recurring themes in geospatial data integration. The juxtaposition of "opportunity" with "lack" and "challenge" suggests a recognition of both the obstacles and potential rewards associated with overcoming these hurdles.

b. Overlay visualization: The overlay visualization provides a temporal dimension to the research themes:

- Early Discussions (2020): Terms such as "decentralization" and "implementation" appear more prominently in earlier years, reflecting a focus on Indonesia's decentralized governance systems and the initial challenges of implementing the One Data One Map (ODOM) initiative.
- Recent Trends (2021 and beyond): Keywords such as "Bogor," "Bekasi," and "map" emerge more frequently in recent years. This indicates a shift from broader policy discussions to more focused, region-specific studies on the practical implementation of ODOM at the regency level.

As shown in Figure 1, the overlay visualization highlights this transition from general governance themes to region-specific research.

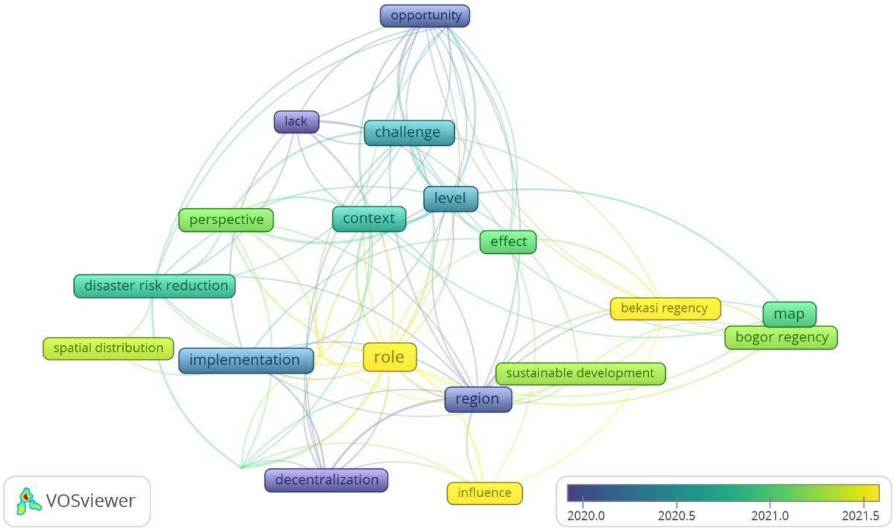

Figure 1. shows overlay visualization

c. Key Insights and Research Gaps: The analysis reveals critical areas for further exploration, as summarized below:

- Implementation and Governance: Terms such as "implementation," "challenge," and "decentralization" frequently appear together, highlighting persistent difficulties in integrating geospatial data across multiple levels of governance. The complexity of decentralized governance in Indonesia poses significant barriers to effectively localizing the ODOM initiative. Figure 2 provides a density visualization of these governance-related-terms.

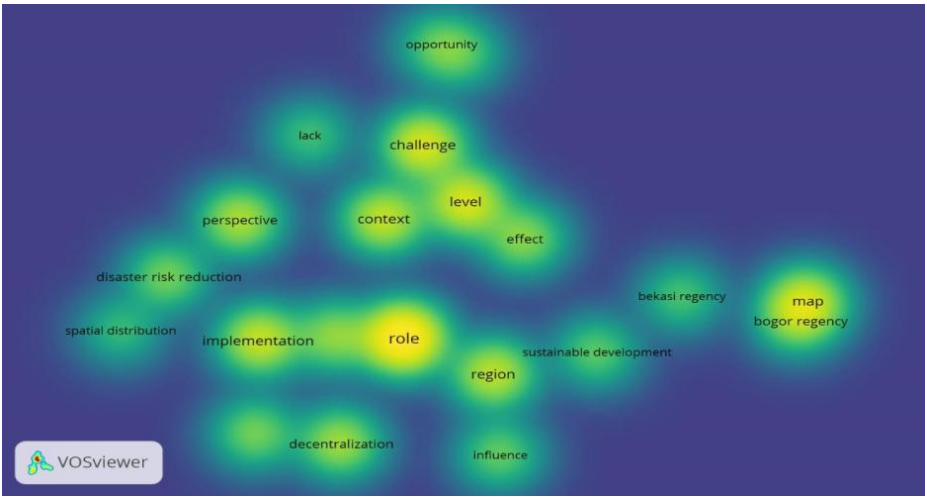

Figure 2. describes density visualization.

- Regional Studies: Bogor and Bekasi regencies are emerging as critical case studies for understanding geospatial data integration. However, there is a noticeable lack of research examining these regions' unique socio-political contexts, indicating a need for more in-depth regional studies.
- Sustainability and Development: While terms like "sustainable development" are present in the analysis, their relatively low centrality suggests that sustainability is acknowledged as a relevant concept but not a primary focus of current research. Future studies should explore how geospatial data integration can directly contribute to broader sustainability goals.

d. Frequency Analysis of Research Terms: The VOS viewer analysis identified 374 instances of recurring terms across the research corpus, summarized as follows:

- Spatial Distribution: 10 instances
- Opportunity: 13 instances
- Challenge: 34 instances
- Implementation: 31 instances
- Decentralization: 23 instances
- Sustainability: 20 instances
- Bogor Regency: 16 instances
- Bekasi Regency: 12 instances
- Local Governance Structure: 17 instances
- Disaster Risk Reduction: 17 instances
- Map: 28 instances
- Role: 56 instances

These frequencies underscore the significant attention paid to implementation challenges, decentralized governance, and the emerging importance of regional case studies in Bogor and Bekasi regencies.

e. Identified Research Gaps: While the existing body of research provides valuable insights, several gaps remain:

- Implementation Challenges: The practical execution of geospatial data integration initiatives under decentralized governance frameworks remains underexplored. Research should prioritize identifying and addressing the obstacles faced during implementation.
- Stakeholder Perspectives: Limited attention has been given to understanding the roles and perceptions of various stakeholders, including policymakers, operators, and end-users. Investigating these perspectives can enhance collaboration and program effectiveness.
- Sustainability Integration: Although the role of geospatial data in achieving sustainable development is acknowledged, explicit connections between geospatial integration efforts and sustainability outcomes require further exploration.

3 Methodology

3.1 Research Design

This research employed a mixed methodology, combining qualitative and quantitative techniques to examine the views and impacts of the ODOM initiative. We utilized a descriptive cross-sectional design to obtain stakeholders' viewpoints at a particular time, providing a snapshot of geospatial information integration and its difficulties in the Bogor and Bekasi regencies.

3.2 Data Collection

The research adopts a mixed-methods approach, combining qualitative and quantitative techniques to assess the effectiveness of the "One Data, One Map" (ODOM) initiative in Bogor and Bekasi regencies. Data collection was conducted over eight months, from October 2023 to May 2024, involving a diverse group of 125 stakeholders. These stakeholders included policymakers, responsible for decision-making and policy implementation; operators, engaged in the technical management of geospatial data; and end-users, such as community members and organizations, who utilize the data for decision-making.

The study employed three primary data collection methods. First, **surveys** were distributed to all stakeholder groups to gather quantitative data on their perceptions of ODOM. Second, **focus group discussions** were conducted with key stakeholder groups to explore qualitative insights on challenges, opportunities, and perceptions related to geospatial data integration. Finally, **structured interviews** were held with selected participants to delve deeper into specific issues, such as data inconsistencies and dispute resolution mechanisms.

The research also applied the Exponential Comparison Method (ECM) Decision Matrix to prioritize strategic initiatives and analyze stakeholder preferences. This approach enabled a nuanced understanding of the factors influencing the success of the ODOM initiative across the two regencies.

3.2.1 Participants

- Participants in this study included a diverse group of stakeholders from the Bogor and Bekasi regencies:
- **Policymakers:** Government officials responsible for formulating and implementing policies related to geospatial data integration.
- **Operators:** Technical personnel involved in managing and maintaining geospatial data systems.
- **End-Users:** Community members and organizations that rely on geospatial data for decision-making, resource management, and planning.

3.3 Statistical Analysis

3.3.1 Hypothesis Testing

Table 1. shows the Data Preparation of the variables

Category	Variable	Type	Encoding
Dependent	Overall Perception of the One Data One Map Program	Categorical	1= Poor, Fair=2, Neutral= 3, Good= 4, Excellent=5
Independent	Experience with Dispute Resolution	Binary	Yes (1), No (0)
Independent	Location	Categorical	Bogor Regency (1), Bekasi Regency (2)

Analysis

This study aims to determine the influence of dispute resolution experience on the overall perception of ODOM across Bogor and Bekasi regencies.

- Hypothesis ($H_{1.1}$): The experience with dispute resolution significantly influences the overall perception of the program differently across locations (Bogor, Bekasi regencies).

A multiple linear regression analysis was performed to examine the relationships between the variables. The analysis involved the main effects of experience with dispute resolution and locations and the interaction effect between these two variables on the overall view.

The Regression Formula:

$$Y = \beta 0 + \beta 1X1 + \beta 2X2 + \beta 3(X1 \times X2) + \epsilon$$

- Y = Overall Perception
- $\beta 0$ = Intercept
- $\beta 1$= The coefficient for Experience with Dispute Resolution ($X1$)
- $\beta 2$ = The Coefficient for Location ($X2$)
- $\beta 3$ = Coefficient for the Interaction Term ($X1 \times X2$)
- ϵ = Error term

Table 2. shows the Data Preparation of the variables

Category	Variable	Type	Encoding
Dependent	Overall Perception of the One Data One Map Program	Categorical	1= Poor, Fair=2, Neutral= 3, Good= 4, Excellent=5

Independent	Experience with Dispute Resolution	Binary	Yes (1), No (0)
Independent	Location	Categorical	Bogor Regency (1), Bekasi Regency (2)

Descriptive Statistics
The summary of Descriptive statistics is described below:

Table 3. shows the descriptive statistics.

Variable	**Mean**	**Std. Deviation**	**N**
Overall Perception	3.78	1.052	125
Experience with Dispute Resolution	.86	.353	125
Location	1.50	.502	125
Interaction	1.3200	.71392	125

Correlation Analysis
Relationships between variables are shown via the Pearson correlation coefficients.\

Table 4. shows the correlation analysis

Variable	**Overall Perception**	**Experience with Dispute Resolution**	**Location**	**Interaction**
Overall Perception	1.000	0.416	0.345	0.436

Experience with Dispute Resolution	0.416	1.000	0.186	0.761
Location	0.345	0.186	1.000	0.739
Interaction	0.436	0.761	0.739	1.000

Significance Levels (1-tailed)
Except for the location-experience-with-dispute-resolution association, which is significant at the 0.05 level, all correlations are significant at the 0.01 level.

Regression Analysis

Model Summary
The model summary for the regression without the interaction term is described in Table 5, and the regression with the interaction term in Table 6.

Table 5. shows the model summary without interaction

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.497	0.247	0.235	0.920

Table 6. shows the model summary with the interaction term

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.538	0.289	0.272	0.897

ANOVA
The ANOVA table for the regression without the interaction term is described in Table 7.
Table 7. shows Anova without the interaction term

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	39.706	3	13.235	16.432	0.000
Residual	97.462	121	0.805		
Total	137.168	124			

Coefficients

The coefficients for the regression without the interaction term are in Table 8, and the coefficients for the regression with the interaction term are described in Table 9.

Table 8. shows the coefficients for regression without interaction

Variable	B	Std. Error	Beta	t	Sig.
(Constant)	1.979	0.305		6.495	0.000
Experience with Dispute Resolution	1.087	0.239	0.364	4.556	0.000
Location	0.582	0.167	0.278	3.475	0.001

Table 9. shows the coefficients for regression with interaction

Variable	B	Std. Error	Beta	t	Sig.
(Constant)	0.462	0.639		0.722	0.472
Experience with Dispute Resolution	2.853	0.699	0.956	4.081	0.000
Location	1.769	0.472	0.844	3.746	0.000
Interaction	-1.349	0.503	-0.916	-2.679	0.008

Residuals Statistics

The residuals statistics table for the regression with the interaction term is described in Table 10.

Table 10. shows the statistics of the residual

Statistic	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	2.23	4.16	3.78	0.566	125
Std. Predicted Value	-2.745	0.656	0.000	1.000	125
Standard Error of Predicted Value	0.118	0.401	0.147	0.065	125
Adjusted Predicted Value	2.08	4.25	3.78	0.568	125
Residual	-2.735	1.769	0.000	0.887	125
Std. Residual	-3.047	1.971	0.000	0.988	125
Stud. Residual	-3.079	2.052	0.000	1.005	125
Deleted Residual	-2.792	1.917	0.000	0.918	125
Stud. Deleted Residual	-3.194	2.080	-0.002	1.017	125
Mahal. Distance	1.146	23.808	2.976	4.810	125
Cook's Distance	0.000	0.097	0.009	0.020	125
Centered Leverage Value	0.009	0.192	0.024	0.039	125

Calculations

To illustrate the calculations, coefficients from the regression with the interaction term are calculated as below:

Regression Equation:

$$Y = 0.462+2.853X1 +1.769X2 – 1.349 (X1 \times X2)$$

- Y = Overall Perception
- X1 = Experience with Dispute Resolution
- X2 = Location
- X1 ×X2= Interaction between Experience with Dispute Resolution and Location

- X1=1 (High Experience with Dispute Resolution)
- X2 =1 (Bekasi regency)
- Then the interaction term X1 ×X2 = 1

Using the regression equation:

- $Y = 0.462 + 2.853(1) + 1.769(1) - 1.349(1 \times 1)$
- $Y = 0.462 + 2.853 + 1.769 - 1.349$
- $Y=3.735$

The regression analysis, including the interaction term, shows many significant findings that Location and experience with dispute resolution are vital indicators of overall perception. The strong interaction term between Experience with Dispute Resolution and Location suggests that this impact on Overall Perception differs by Location. The model accounts for 28.9% of the variation in Overall Perception. The statistical analysis confirms the hypothesis that the substantial interaction effect implies that geography moderates the impact of dispute resolution experience on overall impression, demonstrating that Bogor and Bekasi regencies vary.

4. Findings and Discussion

4.1 Current Status of Geospatial Data Integration in Bogor and Bekasi Regencies

The current status of geospatial data integration in Bogor and Bekasi regencies reveals significant challenges that hinder the effectiveness of the "One Data, One Map" (ODOM) initiative. One major issue is **overlapping and inconsistent data**. Discrepancies in geospatial data across various government agencies and stakeholders create obstacles to achieving a unified geospatial data framework. This lack of alignment results in inefficiencies in data sharing and utilization (Kharisma & Sagala, 2018; Letsoin et al., 2018).

Another critical challenge is the prevalence of **disputes over data ownership and jurisdiction**. Issues such as unclear hosting responsibilities, jurisdictional limits, and data quality problems often complicate the integration process, slowing down progress toward a seamless data system (Bachry, 2019).

Additionally, the integration process suffers from **limited stakeholder engagement**, which adversely affects collaboration between data management processes and governance practices. This lack of coordination impairs the effective delivery of geospatial initiatives, limiting the growth of resource services and decision-making efficiency (Adi et al., 2020). Addressing these issues is essential for achieving the full potential of the ODOM initiative.

4.2 Collaborative Governance Strategies for Enhanced Geospatial Data Integration

Collaborative governance plays a crucial role in enhancing geospatial data integration in Bogor and Bekasi regencies. One proposed solution involves **collaborative management strategies** aimed at reducing data variation, resolving anomalies, and establishing open data-sharing protocols. These measures can help create a more unified and

reliable geospatial framework. The involvement of diverse stakeholders, including **local communities, private sector entities, and non-governmental organizations**, is essential for the successful development and implementation of ODOM programs. Incorporating varied perspectives ensures that the programs are inclusive and responsive to different needs (Saxena, 2017). Furthermore, challenges related to **data quality, software compatibility, and time intervals** can be mitigated through effective resolution mechanisms. Tools such as mediation, agreements, and legal measures are critical to ensuring the smooth execution of data updates and minimizing conflicts among stakeholders. Additionally, clear data protocols and regulations must function cohesively across the ODOM ecosystem. These frameworks increase transparency, strengthen accountability, and enable more efficient data-driven decision-making and service delivery at the local level (Yerden & Luna-Reyes, 2021).

4.3 Implications for Local Governance and Sustainable Development

The "One Data, One Map" (ODOM) program offers significant potential to transform local governance in **Bogor and Bekasi Regencies** through effective data integration. By consolidating regional government data into a unified platform, ODOM facilitates data-driven decision-making processes that are more accurate, equitable, and efficient. This integration enables better distribution of resources, transparent pricing mechanisms, and improved policy planning.

Additionally, leveraging geospatial data promotes sustainable development by equipping local governments in **both regencies** with tools to monitor and optimize resource usage, plan urban growth responsibly, and respond proactively to environmental and infrastructural challenges. The ability to make timely, evidence-based decisions ultimately fosters greater resilience and adaptability in local governance systems, paving the way for more liberal and sustainable development.

4.4 Effectiveness of Geospatial Data Integration

4.4.1 Perceived Benefits in Local Governance

Geospatial data integration under the ODOM initiative has provided substantial benefits to local governance in **Bogor and Bekasi Regencies**. A key improvement has been the consolidation of property rights, which has reduced disputes and ensured clearer jurisdictional boundaries. For instance, the implementation of integrated planning protocols has enhanced disaster management by providing more accurate and timely responses to emergencies.

Furthermore, the integration of geospatial data has facilitated more effective policy formulation and resource allocation. Stakeholders in **both regencies** report improved resource management and operational planning, enabling targeted interventions for infrastructure development and public service delivery. These advancements contribute to a governance framework that is more efficient, responsive, and aligned with local development goals.

4.5 Differences in Implementation between Bogor and Bekasi Regencies

Although the ODOM initiative has garnered widespread support across **both Bogor and Bekasi Regencies**, its implementation and impact differ significantly. **Bogor Regency** has demonstrated impressive results in geospatial data integration due to its advanced technological infrastructure and robust institutional frameworks. These factors have enabled more effective data utilization, resulting in higher levels of stakeholder satisfaction and better governance outcomes. In contrast, **Bekasi Regency** faces challenges stemming from resource constraints and limited access to technological tools. These shortcomings have hindered the full implementation of the ODOM program, leaving gaps in data quality and accessibility. Addressing these disparities requires targeted investments in technology and capacity-building efforts to ensure equitable progress across both regions.

4.6 Dispute Resolution Mechanisms

4.6.1 Common Disputes Encountered in Geospatial Data Management

Common disputes in geospatial data management often arise from inaccuracies or incomplete datasets. In **both Bogor and Bekasi Regencies**, disagreements frequently occur over land ownership, resource allocation, and jurisdictional boundaries. These disputes are exacerbated by inconsistencies in data formats and the lack of standardized practices, which lead to mistrust among stakeholders. Resolving these disputes requires a collaborative approach that addresses the root causes of inaccuracies while ensuring transparency and accountability in data management processes. Effective conflict resolution mechanisms can mitigate tensions and promote smoother data integration efforts.

4.7 Effectiveness of Current Dispute Resolution Mechanisms

The current dispute resolution mechanisms employed in **Bogor and Bekasi Regencies** show mixed effectiveness. Mediation and negotiation have achieved some success in resolving conflicts; however, significant gaps remain in the legal framework and technical capacity of stakeholders. For instance, a lack of explicit guidelines and robust enforcement mechanisms limits the ability to address disputes comprehensively. To improve dispute resolution, it is crucial to establish more robust legal frameworks and enhance technical tools for resolving conflicts. Clearer regulations and greater stakeholder training can empower local governments in **both regencies** to address disputes effectively, fostering trust and collaboration among all involved parties.

4.8 Stakeholder Perceptions

4.8.1 Influence of Dispute Resolution Experiences on Overall Perceptions of the ODOM Program

Stakeholders' perceptions of the ODOM program in **Bogor and Bekasi Regencies** are strongly influenced by their experiences with dispute resolution. Positive outcomes from mediated disputes foster trust and confidence in the program, encouraging further participation and collaboration. Conversely, unresolved conflicts or perceived biases in the resolution process create skepticism and reluctance among stakeholders to engage with the initiative. These findings highlight the importance of equitable and transparent

dispute resolution mechanisms in shaping stakeholder satisfaction. By addressing disputes effectively, the ODOM program can enhance its credibility and build stronger relationships with local communities and organizations.

4.9 Differences in Perceptions between Policymakers, Operators, and Users

Perceptions of the ODOM initiative vary among key stakeholder groups in **Bogor and Bekasi Regencies**, including policymakers, operators, and end-users. Policymakers generally view the program favorably, recognizing its strategic importance for governance and planning. Operators, however, express concerns about technical and operational challenges, such as data consistency and interoperability. End-users, including community members and organizations, demonstrate cautious optimism about the program, with their confidence largely influenced by direct experiences with accurate data and problem resolution. Bridging these differing perspectives requires tailored communication and engagement strategies to align stakeholder expectations and foster collective buy-in.

4.10 Challenges in Geospatial Data Integration

This study identified several significant challenges that hinder the integration of geospatial data for local governance in Bogor and Bekasi regencies. One key challenge is the **lack of data standardization and interoperability**. Variations in data formats and protocols across agencies make it difficult to establish seamless data integration standards, creating inefficiencies and discrepancies in geospatial systems. Another major obstacle is the prevalence of **data silos and limited interagency data sharing**. The existence of isolated data systems and the lack of collaboration among agencies impede the smooth flow and utilization of geospatial information. Additionally, **disputes over data ownership, jurisdiction, and quality** further complicate integration efforts. Persistent disagreements over who owns the data, the boundaries of jurisdictional control, and the accuracy of datasets have created barriers to building trust and collaboration among stakeholders. Lastly, the **limited involvement of stakeholders** in governance and data management processes negatively affects the success of the ODOM initiative. As noted by Lengoiboni et al. (2019), the exclusion of key groups from decision-making leads to a lack of buy-in and hampers the program's overall effectiveness. Addressing these challenges is critical to ensuring the sustainable implementation of geospatial data integration in both regencies.

4.11 Opportunities for Enhancing Geospatial Data Integration

Despite these challenges, the study highlights several opportunities for improving geospatial data integration in Bogor and Bekasi regencies. A priority is to **improve the dispute resolution system**, ensuring that it is more transparent, effective, and accessible to all stakeholders. By establishing a reliable mechanism for resolving conflicts over data ownership, jurisdiction, and quality, trust and collaboration among stakeholders can be strengthened. Another critical opportunity lies in **increasing stakeholder engagement**. ODOM programs should be designed and implemented with active involvement from communities, private organizations, and government agencies. Broad-based

participation fosters inclusivity and ensures that diverse perspectives and expertise contribute to the program's success. Furthermore, there is a need to **invest in capacity building**. Strengthening the technical and institutional capacity of local government bodies can enhance their ability to manage and utilize geospatial data effectively. Training programs and resources should focus on data management, analysis, and integration techniques to empower stakeholders. To streamline operations, it is essential to **align policies and regulations** related to geospatial data management. Harmonizing these frameworks can eliminate redundancies and inconsistencies, making implementation and integration more efficient. Lastly, adopting **advanced technology and standardized practices** can improve data integration and quality. Leveraging cutting-edge tools and globally recognized standards can enhance the overall effectiveness of geospatial systems, supporting regional governance goals and sustainable development.

4.12. Formulating strategy using ECM Decision Matrix

The Exponential Comparison Method (ECM) was employed to evaluate and enhance the effectiveness of the "One Data, One Map" (ODOM) program in **Bogor and Bekasi Regencies**. The analysis focused on five key criteria: accuracy, timeliness, accessibility, ease of use, and stakeholder inclusion. Four strategic alternatives were assessed: **Technology Upgrade**, **Policy Reform and Stakeholder Engagement**, **Capacity Building and User Support**, and **Decentralization and Local Autonomy**. These strategies were ranked based on their calculated alternative values, as shown in Table 11. Among the alternatives, **Policy Reform and Stakeholder Engagement** emerged as the top priority, with the highest calculated value (2705). This underscores the critical importance of aligning policies with stakeholder needs and fostering inclusive collaboration across all levels of governance. The second-ranked alternative, **Decentralization and Local Autonomy** (2698), highlights the need to empower local governments with greater authority and resources to manage geospatial data effectively.

Capacity Building and User Support (2691) ranked third, emphasizing the importance of equipping local government institutions with technical and institutional capacity to manage and utilize geospatial data efficiently. Lastly, **Technology Upgrade** (2147) ranked fourth, reflecting the role of advanced tools and systems in enhancing geospatial data accuracy, accessibility, and usability.

The ECM Decision Matrix illustrates that while all four alternatives are valuable, prioritizing policy reforms and stakeholder engagement is essential for the ODOM program's success. By addressing these strategic priorities, Bogor and Bekasi regencies can achieve greater integration of geospatial data, improved decision-making processes, and enhanced local governance.

Table 11. ECM Decision Matrix

Alternative / Criteria	C1 (Accuracy)	(C2) Timelines s	(C3) Accessibility	(C4) End of Use	(C5) stakeholder inclusion	Alternative Value	Alternative Priority

Alternative 1 (Technology Upgrade)	3	3	4	4	3	2147	4
A2 (Policy Reform and stakeholder engagement)	4	4	4	4	5	2705	1
A3 (Capacity Building & User Support)	3	3	4	4	5	2691	3
Alternative 4 (Decentralization and Local Autonomy)	3	4	4	4	5	2698	2
Weight of Criteria	2	2	5	5	4		

5. Conclusion and Recommendations

5.1 Conclusion

This research has demonstrated the potential of the "One Data, One Map" (ODOM) initiative to significantly improve geospatial data integration in both Bogor and Bekasi regencies. While the program has achieved substantial progress in addressing data inconsistencies and fostering collaboration, several challenges remain, including issues related to data ownership, jurisdictional disputes, and limited stakeholder engagement. The findings highlight that effective policy reform, increased stakeholder involvement, and capacity-building initiatives are critical to overcoming these challenges. Moreover, the Exponential Comparison Method (ECM) analysis underscores the strategic importance of aligning policies with stakeholder needs, decentralizing governance structures, and leveraging advanced technology to enhance data integration.

By addressing these priorities, local governments in Bogor and Bekasi can establish a robust geospatial framework that supports sustainable development and equitable resource management. These insights provide a valuable roadmap for replicating and scaling the ODOM initiative across other regions in Indonesia and beyond.

5.2 Recommendation

Based on the findings of this research, the following recommendations are proposed to enhance the effectiveness of the "One Data, One Map" (ODOM) initiative in Bogor and Bekasi regencies:

1. Prioritize Policy Reform and Stakeholder Engagement

The ECM Decision Matrix highlights the importance of inclusive and participatory governance. Policy reforms should focus on fostering collaboration through regular forums, workshops, and data-sharing platforms. These platforms will provide opportunities for local communities, private sector entities, and civil society organizations to contribute diverse perspectives during the development and implementation of the ODOM initiative.

2. Intensify Mechanisms for Dispute Resolution

Mediation and arbitration procedures should be developed and integrated into the ODOM framework to address conflicts over data ownership, jurisdiction, and quality.

Effective dispute resolution mechanisms will ensure smoother data integration and foster trust and collaboration among stakeholders.

3. Standardize Data-Sharing Protocols

Unified processes and policies for geospatial data sharing are essential within the ODOM ecosystem. Standardization will enhance transparency, accountability, and interoperability across government agencies, ultimately improving decision-making processes.

4. Build Technical and Institutional Capacity

Local government agencies must strengthen their capacity for managing and utilizing geospatial data effectively. Targeted capacity-building programs should include training in data management, analysis, and integration, as identified by the ECM Decision Matrix. This will empower stakeholders to leverage the ODOM initiative more efficiently in local governance.

5. Integrate the ODOM Initiative with Broader Development Planning

The ODOM initiative should be aligned with local development planning to maximize its benefits for urban planning, resource management, and disaster response. This integration will ensure geospatial data contributes to sustainable and equitable development, addressing key regional challenges proactively.

Reference

1. Anantya, A. (2023). Effective implementation of the One Data One Map Initiative in Indonesia (Master's thesis). University of Indonesia.
2. Agustina, I. H. (2021). A study of flood-prone areas in Bekasi Regency. *Journal of Geography Gea*, 21(2), 180–186. https://doi.org/10.1016/j.envdev.2021.12.003.
3. Amiludin, A., & Asmawi, M. (2020). Problems and legal dimensions in spatial planning according to Law Number 26 of 2007. *Indonesian Journal of Law and Policy Studies*, 1(2), 106–113. https://doi.org/10.31000/ijlp.v1i2.2781
4. Uitto, J. I., & Batra, G. (2022). Application of geospatial methods in evaluating environmental interventions and related socioeconomic benefits. In *Transformational Change for People and the Planet, Sustainable Development Goals Series* (pp. 275–287). Springer. https://doi.org/10.1007/978-3-030-78853-7_19
5. Indonesian Government. (2019). Presidential Regulation Number 39 of 2019. *Jakarta: Government Printing Office, Government of Indonesia.* Available at: https://peraturan.bpk.go.id/Home/Details/108813/perpres-no-39-tahun-2019
6. Wiwin, W., Ardika, W. D., & Putra, N. D. (2020). Collaborative governance: A conceptual model of destination management in the Besakih Temple area, Karangasem Regency, Bali Province. *Journal of Tourism and Hospitality Management*. https://doi.org/10.15640/jthm.v8n1a8
7. Bachry, J. (2019). Analysis of conflicts in the implementation of spatial planning policies in sustainable tourism development in the Rinjani-Lombok Geopark area, West Nusa Tenggara Province. *Media Bina Ilmiah*, 13, 1879. https://doi.org/10.33758/mbi.v13i12.334
8. Yerden, X., & Luna-Reyes, L. F. (2021). Promoting government impacts through open data: Key influential factors. *Proceedings of the 22nd Annual International Conference on Digital Government Research*. https://doi.org/10.1145/3463677.3463711

9. Astari, A. J., Mohamed, A., & Ridwana, R. (2021). The role of geographic information science in achieving sustainable development goals (SDGs) during the COVID-19 pandemic. *Indonesian University of Education Press, Journal of Geography Gea*, 21(2), 112–122. https://doi.org/10.17509/gea.v21i2.39418
10. Guha, J., & Chakrabarti, B. (2019). Achieving the Sustainable Development Goals (SDGs) through decentralization and the role of local governments: A systematic review. *Commonwealth Journal of Local Governance*, (22), 1–19. UTS ePRESS. https://doi.org/10.5130/cjlg.v0i22.6855
11. Scott, G., & Rajabifard, A. (2017). Sustainable development and geospatial information: A strategic framework for integrating a global policy agenda into national geospatial capabilities. *Geo-Spatial Information Science*, 20(2), 59–76. https://doi.org/10.1080/10095020.2017.1325594
12. Sutanta, H., Diyono, D., & Deva, S. (2018). Geospatial information utilization in Indonesian local government. *Proceedings of the 2018 International Conference on Science and Technology in Climate Change (ICSTC)*. https://doi.org/10.1109/icstc.2018.8528707
13. Kraak, M. J., & Ormeling, F. (2020). *Cartography: Visualization of geospatial data* (4th ed.). Taylor & Francis. https://doi.org/10.1201/9780429464195
14. Putra, T. Y. D., Sekimoto, Y., & Shibasaki, R. (2019). Toward the evolution of national spatial data infrastructure development in Indonesia. *ISPRS International Journal of Geo-Information*, 8(6), 263. https://doi.org/10.3390/ijgi8060263
15. Kharisma, I., & Sagala, S. (2018). Implementation of spatial data infrastructure in Cianjur District for disaster risk management purposes. *IOP Conference Series: Earth and Environmental Science*, 145, 012013. https://doi.org/10.1088/1755-1315/145/1/012013
16. Letsoin, H. S., Santoso, A. J., & Suyoto, S. (2018). Designing a web-based GIS application using the CSF method: A case study in Boven Digoel, Papua. *E3S Web of Conferences*, 31, 12005. https://doi.org/10.1051/e3sconf/20183112005
17. Saxena, S. (2017). "Usage by stakeholders" as the objective of "transparency-by-design" in open government data. *Information and Learning Sciences*, 118(7/8), 420–432. https://doi.org/10.1108/ils-05-2017-0034
18. Adi, S., Heripracoyo, S., & Irwansyah, E. (2020). Community participation in the development of spatial and tabular village databases in Indonesia: A case study of Poncol, Pekalongan, Central Java. *Proceedings of the 3rd International Conference on Information Management and Technology (ICIMTech)*, 2020, 300–305. https://doi.org/10.1109/icimtech50083.2020.9211224