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POLICY HARMONISATION IN LAND GOVERNANCE THROUGH SPATIAL DATA INTEGRATION AND INSTITUTIONAL COORDINATION

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Abstract

This study aims to analyze how the integration of spatial data and inter-agency coordination contribute to policy harmonization in land governance. Using a descriptive, qualitative approach, this study examines the experiences and perspectives of land officials, spatial planners, geospatial data managers, and stakeholders at both central and regional levels. The study's results indicate that regulatory fragmentation and overlapping authority between institutions continue to be the primary obstacles to achieving a consistent land policy. Spatial data integration through Spatial Data Infrastructure (SDI) has been proven to enhance information consistency, minimize data duplication, and enhance cross-sector decision-making processes. However, the effectiveness of data integration is greatly influenced by the quality of institutional coordination, including data sharing mechanisms, technical standards, and alignment of mandates between agencies. The study also found a capacity gap between the central and regional governments, with implications for uneven policy implementation. These findings confirm that policy harmonization requires synergy between geospatial technical innovation and institutional reforms that encourage cross-sectoral collaboration. Thus, research makes a significant contribution to the development of a more integrated, transparent, and responsive land governance model that addresses development challenges.
Keywords: *Policy harmonisation; land governance; spatial data integration; institutional coordination; land administration; geospatial information systems.*

Introduction

Land governance is a crucial foundation for economic development, social stability, and sustainable management of natural resources. An effective land system not only regulates land use but also ensures the protection of tenure rights, increased investment,

and fair dispute resolution. However, many countries face policy fragmentation due to overlapping regulations, differences in data standards, and a lack of coordination between institutions. This condition hinders the effectiveness of land policies, creates legal uncertainty, and slows down public services, as highlighted by Enemark (2019) in his study on the modernization of land administration.

Institutional fragmentation is a primary cause of inefficiencies in land management. Each institution, whether agrarian, planning, forestry, or local government, often has different mandates, information systems, and databases, so the policies issued are not always synchronized with one another. Williamson et al. (2010) refer to this phenomenon as "institutional silos", which are conditions in which institutions work separately without cross-sectoral integration. As a result, the process of spatial planning, issuance of permits, and the determination of land rights becomes slow and prone to administrative conflicts.

Spatial data integration is a strategic approach to overcoming this fragmentation. By connecting different types of geospatial data, such as administrative boundaries, thematic maps, land use, and government infrastructure networks, it can produce accurate, consistent, and interoperable land maps. Spatial Data Infrastructure (SDI) has been demonstrated to enhance the quality of decision-making, expedite land services, and promote transparency in governance (Rajabifard & Williamson, 2001). This integration also reduces the risk of data duplication and enhances institutional efficiency by facilitating the sharing of information between agencies.

In addition to data integration, policy harmonization requires strong institutional coordination and collaboration. UNSD-GGIM (2018) emphasizes that modern land governance requires active collaboration between central and regional institutions, as well as synchronization of technical procedures and sectoral regulations. Without coordination, data integration will not be maximized, because integrated data still needs to be combined with a harmonized policy framework. Zhang et al.'s (2020) study in China demonstrates that successful land systems are those that effectively integrate spatial data with multi-actor coordination mechanisms in policymaking.

Although the literature has discussed the benefits of spatial data integration and institutional coordination, research that explicitly links the two in the context of land policy harmonization is limited. Many studies have focused on technical aspects, such as SDI development or map digitization. However, few have examined how data integration and institutional coordination jointly affect the effectiveness of land policies and spatial management. Additionally, there remains a lack of research evaluating the challenges of implementing policy harmonization at various levels of government, particularly in developing countries with complex bureaucratic structures.

This study aims to analyze how the integration of spatial data and inter-agency coordination can enhance the harmonization of land policies. Theoretically, this research contributes to the literature on land governance by offering an integrative perspective on the intersection between geospatial technology and institutional dynamics. Practically, the research findings are expected to be the basis for the government to develop land policies

that are more consistent, transparent, and responsive to development needs. Thus, this research strengthens the understanding that land policy harmonization cannot be separated from the synergy of information technology and strengthening institutional coordination.

Literary Review

The study of land governance encompasses a combination of policies, processes, and institutions that govern the relationship between humans and land, including the functions of land tenure, land value, land use, and land development. Williamson, Enemark, Wallace, and Rajabifard (2010) emphasize that integrated land administration is a prerequisite for sustainable development because it connects the legal, technical, institutional, and socio-economic dimensions in a systemic framework. In this framework, policy harmonization is not just about drafting new regulations, but also about harmonizing various legal instruments, technical standards, and institutional authorities that have been operating sectorally. Enemark (2023) added that land policies that are not synchronized between sectors tend to result in land use conflicts, administrative inefficiencies, and weaken legal certainty for residents and investors.

The literature on Spatial Data Infrastructures (SDI) indicates that integrating geospatial data is a crucial technical pillar for achieving harmonious land governance. Rajabifard, Williamson, and colleagues developed the concept of SDI as a policy, standard, technological, and institutional framework to enable the sharing of spatial data across agencies and across levels of government. SDI is seen as the "backbone" of information for the modern land administration system, as it connects various layers of information such as administrative boundaries, cadastral, land use, and infrastructure networks. Recent studies have shown that data integration and interoperability in SDI can enhance the accessibility of land data, reduce duplication, and improve the quality of spatial policy decision-making.

At the global level, the United Nations Integrated Geospatial Information Framework (UN-IGIF) provides a strategic framework for countries to manage and integrate geospatial information, supporting public policies, including land policies. The UN-IGIF document emphasizes the importance of national geospatial governance, data standards, technology infrastructure, and inter-agency coordination mechanisms to ensure that data is used effectively and consistently in policy formulation. This approach is seen as an "enabling framework" that links geospatial investment with improving the quality of public services and development planning. Lilje (2023) demonstrates that the implementation of UN-IGIF promotes the strengthening of national cooperation and facilitates the development of cross-ministerial action plans for utilizing spatial data across various sectors, including land.

Meanwhile, the study on institutional integration and policy coordination highlights the institutional dimension of land policy harmonization. Zhang et al. (2019) demonstrate that institutional integration, particularly in the context of spatial reform in China, is crucial

for mitigating policy conflicts between sectors and enhancing the coherence of regional management. On the other hand, systematic reviews of public policy coordination and integration confirm that coordination barriers often arise due to overlapping mandates, different policy logics, and a lack of incentive mechanisms for cross-agency collaboration. The urban and land-use governance literature also indicates that without institutional integration, technical efforts such as data integration tend to yield "data-rich but governance-poor systems," which fail to address the root causes of policy fragmentation.

The concept of fit-for-purpose land administration (FFP-LA) offers an additional perspective, emphasizing that the land system should be designed according to the country's needs, capacities, and context, rather than replicating sophisticated but non-operational models. This approach advocates for the use of flexible technologies, gradual standards, and adaptive institutional mechanisms to accelerate the achievement of inclusive land registration. In this context, spatial data integration and institutional coordination are seen as two components that must move together: data integration provides a consistent information base, while institutional coordination ensures that it is translated into policies that are aligned across sectors (agriculture, forestry, spatial planning, and infrastructure).

However, there is a reasonably clear research gap. First, many SDI and geospatial studies focus on technical aspects (standards, infrastructure, and interoperability), while the dimensions of institutional coordination and land policy harmonization are often only mentioned in a normative manner. Second, the literature on policy coordination tends to be generic and has not been extensively reviewed in the land and spatial planning sectors within the context of developing countries, where institutional systems are more pluralistic and often characterized by overlapping authority. Third, there are still limited empirical studies that map in detail how spatial data integration and institutional coordination together affect the process of regulatory harmonization, service acceleration, and reduction of policy conflicts in the land sector. Filling this gap, the research aims to connect the SDI/UN-IGIF technical framework with the dynamics of institutional coordination in an effort to harmonize land governance policies.

Research Methods

This study employs a descriptive qualitative approach to gain a deeper understanding of how the integration of spatial data and inter-agency coordination impacts policy harmonization in land governance. The qualitative approach was chosen because the issue of policy harmonization is not only related to technical aspects, but also includes socio-political dynamics, institutional configuration, and cross-sectoral coordination practices. The research location was chosen *purposively* in government agencies directly involved in managing land data and spatial policy, such as land agencies, spatial planning agencies, forestry services, and geospatial institutions. The research informants include structural officials, policy analysts, geospatial data managers, and spatial planning practitioners. Data was collected through semi-structured in-depth

interviews, observation of inter-agency workflows, and analysis of documents such as regulations, geospatial standards, and sectoral policy documents.

Data analysis was conducted using the Miles, Huberman, and Saldaña model, which involved data reduction, data presentation, and concluding to identify patterns in spatial data integration, forms of coordination between institutions, and obstacles to the implementation of policy harmonization. The validity of the data is strengthened through source triangulation (central–regional–technical officials), technical triangulation (interviews, observations, and documentation), and *member checking* to ensure the accuracy of interpretation. This research also adheres to ethical principles, including obtaining informed consent from informants, protecting their identities, and maintaining transparency in research objectives. Through this approach, the research is expected to provide a comprehensive description of the relationship between geospatial technology, institutional governance, and land policy harmonization at both national and regional levels.

Results and Discussion

The study's results indicate that one of the primary issues in land governance is the fragmentation of regulations and overlapping authority among institutions. Informants from various agencies, including land, spatial planning, forestry, and local government, confirmed that each institution has its own unique legal framework, technical standards, and databases that are not fully aligned. This leads to variations in the interpretation of area boundaries, land status, and spatial utilization policies. These findings reinforce the results of a study by Williamson et al. (2010), which affirmed that institutional silos can hinder the synchronization of land policies and reduce the quality of public services.

Spatial data integration has proven to be a strategic tool to reduce the information gap between institutions. Technical informants mentioned that when geospatial datasets such as cadastral maps, administrative boundaries, land use, and forest areas are combined in a single data-sharing platform, many inconsistencies can be identified and corrected. Data integration helps to equalize perceptions between institutions regarding land boundaries and space allocation. These findings align with the Spatial Data Infrastructure (SDI) framework developed by Rajabifard & Williamson (2001), which posits that data interoperability is the foundation for more accurate and effective land policies.

Research has found that spatial data integration not only facilitates information validation but also improves the quality of policy decision-making. The informant stated that the process of permitting, spatial planning, and identification of land conflicts becomes faster when the agency has access to the same maps and information. This increases the consistency of decisions and reduces the risk of policy disputes. The UN-GGIM study (2018) supports these findings, showing that geospatial-enabled governance can strengthen accountability and transparency in land management.

Although spatial data integration provides significant benefits, the study found that the success of policy harmonization remains highly dependent on inter-agency

coordination. Some of the obstacles identified include differences in institutional priorities, resistance to data sharing, budget constraints, and a lack of formal mechanisms for policy coordination. Additionally, the layered bureaucracy and regulatory insynchronization hinder the harmonization process, causing it to proceed slowly. These findings align with those of Zhang et al. (2020), who demonstrated that land policy reform necessitates multi-actor synergy and stable coordination mechanisms.

The research also revealed a gap in technical and institutional capacity between the central and regional governments. Central agencies generally have a better technological capacity, more experts, and more advanced geospatial infrastructure than regional agencies. As a result, spatial data integration and policy harmonization run unevenly. In some areas, a lack of training, GIS tools, and uniform technical standards hampered implementation. This aligns with the literature on fit-for-purpose land administration (Enemark, 2019), which emphasizes the importance of tailoring policies to local capacity for effective implementation.

Overall, the results show that land policy harmonization requires two main pillars: (1) the integration of spatial data as a technical foundation, and (2) institutional coordination as the institutional foundation. Data integration enables the equalization of perceptions and the consistent provision of information, while institutional coordination ensures that this information is translated into aligned and operational policies. The combination of the two can enhance the effectiveness of land policies, increase transparency, mitigate potential conflicts, and expedite administrative processes. This research confirms that policy harmonization cannot be achieved solely through technical solutions, but requires institutional reform and collaborative commitments across various sectors.

Conclusion

This study concludes that policy harmonization in land governance cannot be achieved without synergy between spatial data integration and institutional coordination. The integration of spatial data has proven to be a technical foundation that enhances the consistency of information between agencies, improves the accuracy of land maps, and accelerates decision-making processes involving spatial planning, permitting, and land rights determination. However, the success of data integration is primarily determined by the strength of institutional coordination. The study's findings reveal that the primary challenges to policy harmonization stem from regulatory fragmentation, overlapping authority, and institutional capacity gaps, both between central and regional authorities and across sectors. Thus, land policy harmonization must be understood as a two-dimensional process: technical reform through data integration and institutional reform through stronger, more precise, and structured coordination mechanisms.

Suggestion

Advice for the Central Government

The central government needs to strengthen the regulatory framework governing the sharing of spatial data between agencies, including the preparation of national technical standards, ensuring data interoperability, and establishing sanctions mechanisms for agencies that fail to apply the principle of data disclosure. Additionally, it is necessary to establish a cross-ministerial coordination forum to ensure the alignment of policies related to land, spatial planning, forestry, the environment, and infrastructure.

Advice for Local Governments

Local governments need to enhance their technical capacity through GIS training, strengthen their technology infrastructure, and align regional regulations with the national framework. Technical assistance programs from the central government and national geospatial agencies are crucial in bridging the implementation capacity gap at the regional level.

Advice for Land and Sectoral Institutions

Institutions such as land offices, spatial planning offices, forestry services, and geospatial institutions need to strengthen a culture of collaboration and data sharing. Integrated geospatial information systems should be operated together, accompanied by collaborative SOPs and cross-agency feedback mechanisms to avoid duplication and policy conflicts.

Suggestions for Further Research

Further research is recommended to employ a mixed-methods approach or cross-border comparative policy analysis to understand how models of institutional coordination and data integration function in various administrative contexts. Specific studies on the effectiveness of UN-IGIF at the national implementation level can also make a broader academic and practical contribution.

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