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Multi-Actor Collaboration In Data-Driven Village Development: A Digital Mapping Approach

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Abstract: *This study examines multi-actor collaboration in implementing data-driven village development systems in Bantaeng Regency, Indonesia, where despite high village development indices, only 4.3% of villages have adopted digital mapping technologies. Using Kingdon's Multi-Actor Theory and Multiple Streams Framework, this qualitative case study analyzed the roles of government actors (regency head, bureaucratic agencies, legislative bodies, village governments) and outside government actors (academics, private sector, media, civil society) through in-depth interviews, direct observation, and document analysis. The findings reveal significant coordination challenges between hierarchical government structures and diverse stakeholder interests, with village-level implementation enthusiasm constrained by absent regency-level regulatory frameworks and limited systematic engagement from outside government actors. While successful pilot implementations in Patteneteang and Biangloe villages demonstrate clear benefits including enhanced transparency, improved planning accuracy, and better service delivery, the absence of formal multi-stakeholder coordination mechanisms prevents systematic scaling across all villages. The analysis through the Multiple Streams Framework shows that despite adequate problem identification and available policy solutions, insufficient political stream coordination limits the emergence of effective policy windows for comprehensive implementation. The study concludes that establishing regency-level multi-stakeholder governance platforms with dedicated regulatory backing and budget allocation would enhance coordination effectiveness and accelerate systematic adoption of data-driven village development initiatives across Indonesian rural contexts*

Keywords: *multi-actor collaboration, digital village development, rural governance, stakeholder coordination, policy implementation*

1. INTRODUCTION

Village development represents a strategic cornerstone in regional governance systems, continuously being advanced through data-driven and participatory approaches worldwide. The transformation from traditional development models to digitally-enabled frameworks has emerged as a critical pathway for enhancing rural communities' quality of life and welfare through improved infrastructure, sustainable natural resource utilization, and comprehensive service delivery (Pierre & Peters, 2020). This paradigm shift reflects a broader global trend toward evidence-based governance that prioritizes transparency, efficiency, and community engagement in development planning and implementation processes.

The evolution of governance paradigms from the 1990s marked a significant transition from 'government' to 'governance', fundamentally altering the landscape of public policy implementation and stakeholder engagement. This transformation involved the strategic transfer of authority from centralized government structures to non-governmental sectors, including private entities, civil society organizations, and individual community members, thereby creating more inclusive and participatory policy-making environments (Melati et al., 2024; Hasyimi et al, 2024). The governance approach recognizes that sustainable development outcomes require collaborative efforts that transcend traditional institutional boundaries and leverage diverse stakeholder capabilities and resources.

Contemporary village development increasingly relies on innovative technological solutions, particularly digital mapping systems and Geographic Information Systems (GIS), to enhance precision and factual accuracy in spatial data visualization and analysis. Digital mapping has evolved from simple navigation tools to comprehensive platforms supporting various sectors including governance, spatial planning, and natural resource management, fundamentally transforming how rural communities approach development planning (Kurowska et al 2020; Yu et al 2020). These technological innovations enable village governments to obtain comprehensive overviews of their territorial conditions, including topography, population distribution, infrastructure location and condition, thereby facilitating more effective, efficient, and data-driven development planning (Ajani, 2025).

The concept of data-driven village development aligns with global sustainable development frameworks, particularly the Sustainable Development Goals (SDGs) at the village level, which emphasize community empowerment through information technology integration. This approach enhances village participation and accessibility through comprehensive information systems that facilitate communication between village communities, village officials, and various stakeholders regarding existing needs and opportunities (Munzir et al., 2024). Valid and updated data becomes essential for designing village development that aims to improve community welfare and living standards while providing public services that maintain ecological balance (Sebestyén & Abonyi, 2021; Bachmann et al, 2022).

Multi-actor collaboration has emerged as a fundamental requirement for successful policy implementation, particularly in complex development initiatives that require diverse expertise, resources, and legitimacy. Previous research has demonstrated varying degrees of success in multi-actor collaborations across different contexts. Amri et al (2022) identified challenges in multi-actor policy formulation for online taxi tariffs in South Sulawesi, where not all actors actively participated in policy formulation, particularly consumer representatives, leading to incomplete policy outcomes. Similarly, Silalahi, et al (2025) found collaboration failures among actors in the peat restoration program in Riau Province, attributed to unclear institutional status and insufficient commitment from political leaders.

However, successful multi-actor collaborations have also been documented, demonstrating the potential for effective stakeholder engagement in development initiatives. Eriyatno et al. (2024) showed how state and non-state actors successfully collaborated in managing Food Loss and Waste in Indonesia, building partnerships that effectively addressed high FLW conditions through coordinated efforts and mutual support systems. Nadia (2022), revealed how pentahelix model actors collaborated to empower coffee farmers, creating comprehensive transformation from cultivation through post-harvest processing to marketing, ultimately improving farmer welfare through coordinated government, private sector, community, media, and academic involvement.

Table 1. Village Development Status in Bantaeng Regency

Village Status	Number of Villages	Percentage
Advanced (Maju)	23	50%
Independent (Mandiri)	23	50%
Developing (Berkembang)	0	0%
Underdeveloped (Tertinggal)	0	0%
Total	**46**	**100%**

Source: PMD-PPA Office, Bantaeng Regency, 2024

Table 2. Digital System Implementation in Bantaeng Regency Villages

Implementation Status	Number of Villages	Percentage
Implemented	2	4.3%
Not Implemented	44	95.7%
Total	**46**	**100%**

Villages with Implementation: Patteneteang Village, Biangloe Village

Source: PMD Office, Bantaeng Regency, 2024

Table 3. Study Visit Trends to Patteneteang Village Digital System

Year	Number of Visiting Villages	Growth Rate
2022	18	-
2023	38	+111%
2024	152	+300%

Source: Patteneteang Village Government, Bantaeng Regency, 2025

In the Indonesian context, particularly in Bantaeng Regency, South Sulawesi Province, a significant paradox emerges between village development achievements and digital system implementation. While all 46 villages in the regency have achieved either advanced or independent status according to the Village Development Index (IDM), with no villages remaining in developing or underdeveloped categories, only two villages (4.3%) have implemented data-driven development systems using digital mapping technologies. This contradiction is particularly striking given the increasing interest from other regions, as evidenced by the dramatic increase in study visits to Patteneteang Village - from 18 villages in 2022 to

152 villages in 2024, representing a 300% growth rate that demonstrates the system's effectiveness and appeal.

Despite extensive research on multi-actor collaboration in various development contexts, significant gaps remain in understanding how different stakeholders contribute to technology-driven village development initiatives, particularly in the Indonesian decentralized governance context. Previous studies have primarily focused on sectoral collaborations or single-issue policy implementations, while comprehensive analysis of multi-actor roles in integrated digital village development systems remains limited. This research addresses this gap by examining the specific roles and interactions of government actors (regency government, village governments, and legislative bodies) and outside government actors (academics, private sector, media, civil society organizations) in implementing data-driven village development systems in Bantaeng Regency. The study's significance lies in its potential to provide actionable insights for scaling successful digital village development models, particularly in contexts where traditional development indicators show progress but technological integration remains limited, thereby contributing to more effective and sustainable rural development strategies in Indonesia and similar developing country contexts.

2. METHOD

This study employed a qualitative descriptive approach with case study design to examine multi-actor roles in data-driven village development implementation in Bantaeng Regency. Following Creswell's (2018) framework for qualitative inquiry, the research utilized in-depth interviews, direct observation, and document analysis to gather comprehensive data from purposively selected informants representing both government actors (Regency Head, PMD-PPA Office, Regional Parliament, and village governments) and outside government actors (academics, private sector, media, and civil society organizations). Data collection involved extensive fieldwork across villages in Bantaeng Regency, with particular focus on the two implementing villages (Patteneteang and Biangloe) and comparative analysis with non-implementing villages. The analytical process followed Creswell's systematic approach of data organization, coding, theme development, and interpretation, while validity was ensured through source triangulation, member checking, and prolonged field engagement. This methodological approach enabled deep exploration of actor interactions, policy implementation challenges, and coordination mechanisms within the complex multi-stakeholder environment of rural digital governance in Indonesia.

3. FINDINGS AND DISCUSSIONS

Government Actor Roles in Data-Driven Village Development Implementation

The implementation of data-driven village development in Bantaeng Regency reveals a complex hierarchical structure of government actors, each operating with distinct levels of authority and commitment. At the administrative level, village heads demonstrate strong support for digital transformation, recognizing its potential for enhanced transparency, improved planning processes, and conflict reduction within their communities. The successful implementation in Patteneteang and Biangloe villages has created tangible benefits including synchronized data alignment with national indicators such as the Village Development Index (IDM) and Village SDGs, enabling more accurate reporting and better-informed decision-making processes.

However, a significant implementation gap exists between village-level enthusiasm and regency-level regulatory support. Village administrators express hesitation to fully commit resources without explicit regulatory frameworks from the regency government, creating a dependency relationship that limits autonomous village innovation. The regency head acknowledges the importance of data-driven development but has not yet translated this recognition into binding policy directives, while bureaucratic institutions like the PMD-PPA Office maintain cautious approaches, preferring to follow existing central government regulations rather than developing innovative local frameworks.

Table 4. Government Actor Roles and Commitment Levels

Actor Category	Actor	Role	Commitment Level	Main Challenges
Administration	Village Head (Implementing)	Direct implementation,	High	Lack of regulatory framework

		community engagement		
Administration	Village Head (Non-implementing)	Policy support, awaiting directives	Medium	Regulatory uncertainty
Administration	Regency Head	Strategic direction, resource allocation	Medium-High	Coordination with legislature
Bureaucrats	PMD-PPA Office	Technical facilitation, monitoring	Medium	Budget constraints, regulatory caution
Parliament	DPRD	Legislation, budget approval, oversight	Low-Medium	Evaluation phase, awaiting results

The theoretical framework of Kingdon (2014) effectively explains this implementation pattern, where government actors operate within hierarchical authority structures that can both enable and constrain policy innovation. The administration level shows mixed commitment patterns, with implementing villages demonstrating high engagement while non-implementing villages await higher-level directives, reflecting the formal authority dependencies inherent in Indonesian decentralized governance structures. Legislative institutions remain in observational mode, conducting evaluations of pilot implementations before committing to broader policy support, which aligns with their constitutional oversight functions but potentially slows systemic adoption. Based on Kaponda (2024), governance framework, establishing clear inter-governmental coordination mechanisms and developing regency-specific regulatory frameworks would enhance government actor synergy and accelerate implementation across all villages.

Outside Government Actor Roles in Data-Driven Village Development Implementation

Outside government actors demonstrate varied levels of engagement and strategic interest in data-driven village development, with each sector contributing distinct value propositions to the implementation process. Private sector actors, particularly local entrepreneurs, recognize significant business opportunities in accessing accurate village-level data for market analysis and investment planning, as evidenced by improved business outcomes in villages with digital systems. The academic sector shows growing interest in conducting research and providing technical expertise, though their involvement remains limited to individual initiatives rather than systematic institutional engagement.

Media actors play a crucial dual role as information disseminators and accountability monitors, utilizing digital village data to verify government program implementation and provide transparent reporting to communities. Their engagement has proven effective in raising awareness about successful implementations and creating public pressure for broader adoption. However, civil society organizations and advocacy groups show minimal systematic involvement, representing a significant gap in community-level support structures that could enhance participatory governance aspects of digital village development.

Table 5. Outside Government Actor Engagement Analysis

Actor Type	Current Role	Engagement Level	Contribution Potential	Barriers to Full Engagement
Private Sector	Market analysis, business development	Medium	High - investment, technology	Regulatory uncertainty
Academics	Research, technical consultation	Low-Medium	High - expertise, evaluation	Limited funding, coordination
Media	Information dissemination, monitoring	Medium-High	Medium - awareness, transparency	Access limitations
Civil Society	Minimal involvement	Low	High - community mobilization	Lack of organizational capacity
Interest Groups	Advocacy, networking	Low	Medium - stakeholder coordination	Limited awareness

The engagement patterns observed align with Kingdon's (2014) outside government actor framework, where different sectors contribute based on their institutional capabilities and interests rather than coordinated strategic planning. Private sector engagement follows market-driven logic, seeking profitable opportunities and regulatory certainty, while academic involvement remains project-based rather than institutionally sustained, limiting the depth and continuity of technical support available to implementing villages.

Media actors demonstrate the most consistent engagement, fulfilling their democratic watchdog function while also serving as policy advocates through positive coverage of successful implementations. The limited involvement of civil society organizations represents a significant missed opportunity, as these actors typically provide crucial bridging functions between government and communities in successful governance initiatives (Ghaus-Pasha, 2005).

Strengthening outside government actor engagement requires developing formal partnership frameworks that clearly define roles, responsibilities, and mutual benefits, similar to successful multi-stakeholder initiatives documented by Asaduzzaman & Virtanen (2020) in food security governance.

Multi-Actor Coordination in Data-Driven Village Development Implementation

The analysis through Kingdon's (2014) Multiple Streams Framework reveals significant coordination challenges across the three policy streams, with each stream showing different levels of development and integration. The problem stream demonstrates adequate identification of rural development challenges and digital governance needs, with stakeholders recognizing the importance of data-driven approaches for improving service delivery and transparency. However, problem analysis remains largely informal and under-resourced, limiting the depth of understanding about specific implementation requirements and community needs across different village contexts.

The policy stream shows strong regulatory support at the national level through various ministerial regulations and presidential directives promoting village digitalization, but lacks coherent local-level policy frameworks that would provide implementation guidance and resource allocation mechanisms. This disconnect between national policy direction and local regulatory frameworks creates implementation uncertainty and reduces village-level confidence in committing resources to digital initiatives.

Table 6. Multi-Actor Coordination Analysis through MSF Streams

Stream Type	Development Level	Key Actors	Coordination Quality	Main Gaps
Problem Stream	Medium	Village governments, academics, media	Informal, fragmented	Systematic needs assessment
Policy Stream	High (national), Low (local)	Central government, regency government	Vertical disconnect	Local regulatory framework
Politics Stream	Medium	Regency head, DPRD, village heads	Emerging consensus	Formal commitment mechanisms
Policy Window	Emerging	All actors	Limited coordination	Systematic dialogue platform

The politics stream demonstrates the most promising developments, with emerging political consensus among key decision-makers about the value of digital village development, though this consensus has not yet translated into concrete policy commitments or resource allocations. The regency head expresses strong conceptual support, legislative actors show increasing interest based on pilot results, and village leaders demonstrate practical enthusiasm, creating favorable political conditions for policy advancement.

Kingdon's theoretical framework effectively explains the current coordination challenges, where the three streams operate semi-independently without systematic integration mechanisms. The absence of effective policy entrepreneurs who could bridge these streams and create policy windows limits the potential for systematic policy change, despite favorable conditions in each individual stream.

The emergence of policy windows requires more systematic coordination mechanisms that bring together all stakeholder categories in structured dialogue processes, enabling the alignment of problem identification, policy solutions, and political commitment that Kingdon identifies as essential for policy change. Following successful multi-actor coordination models documented by Garcia-Alvarez-Coque et al. (2021) in agricultural development, establishing formal multi-stakeholder platforms with clear

governance structures would enhance coordination effectiveness and accelerate policy window emergence.

4. CONCLUSION

This study reveals that multi-actor collaboration in data-driven village development implementation in Bantaeng Regency demonstrates significant potential yet faces substantial coordination challenges across government and outside government actors. Government actors show hierarchical dependency patterns where village-level enthusiasm for digital transformation is constrained by the absence of regency-level regulatory frameworks, while legislative actors maintain observational positions pending comprehensive evaluation of pilot implementations. Outside government actor's exhibit varied engagement levels, with private sector and media showing moderate to high interest driven by business opportunities and accountability functions, respectively, while academic and civil society involvement remains limited and project-based rather than systematically integrated. The analysis through Kingdon's Multiple Streams Framework indicates that while problem identification and policy solutions exist at different governance levels, the political stream lacks sufficient coordination mechanisms to create effective policy windows for systematic implementation across all 46 villages in the regency. The successful implementation in only two villages (4.3%) despite widespread recognition of benefits demonstrates the critical importance of formal multi-stakeholder coordination platforms that can align diverse actor interests and capabilities toward common development objectives. Based on these findings, establishing a regency-level multi-stakeholder governance platform with clear regulatory backing and dedicated budget allocation would enhance coordination effectiveness and accelerate systematic adoption of data-driven village development initiatives. Future research should explore the long-term sustainability impacts of digital village systems and examine comparative multi-actor coordination models across different Indonesian regional contexts to develop more generalizable frameworks for rural digital governance implementation.

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