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THE UTILIZATION OF BIG DATA IN REGIONAL DEVELOPMENT PLANNING: A STUDY ON STRENGTHENING EVIDENCE-BASED POLICY IN LOCAL GOVERNMENT

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Abstract

This study aims to analyze the utilization of big data in regional development planning as a strategy to strengthen evidence-based policy in local government. The research focuses on how big data can support development program planning, poverty reduction, social assistance targeting, and basic-service improvement. This study uses a qualitative method with an exploratory-descriptive approach and conceptual framework development. Data were collected from secondary and documentary sources, including recent peer-reviewed journal articles, policy documents, institutional reports, regional planning materials, and regulatory documents related to big data, digital governance, evidence-based policy, local development planning, poverty alleviation, and public services. The data were analyzed using thematic analysis by classifying the findings into several themes: data integration, evidence-based program formulation, poverty and vulnerability mapping, social assistance targeting, basic-service improvement, institutional readiness, data governance, and public accountability. The findings show that big data can improve regional planning by integrating population records, poverty databases, social assistance data, geospatial information, public-service indicators, village-level data, citizen complaints, and digital feedback. The study contributes by proposing an evidence-based local development planning framework consisting of five dimensions: data integration, analytical interpretation, program prioritization, accountable implementation, and continuous evaluation. This framework emphasizes that big data must be supported by institutional coordination, analytical capacity, ethical safeguards, public participation, and accountable governance to produce more accurate, inclusive, and responsive local development policies.

Keywords: basic services; big data; evidence-based policy; local government; regional development planning.

1. INTRODUCTION

Regional development planning is increasingly required to move beyond routine administrative procedures and become a more analytical, evidence-oriented, and adaptive policy process. Local governments are responsible for translating development priorities into concrete programs related to poverty reduction, social assistance, basic services, infrastructure, health, education, and community welfare. These responsibilities require accurate, timely, and integrated data because development problems at the local level are often multidimensional and spatially uneven. Poverty, for instance, cannot be understood only through income indicators, but must also be analyzed through employment, housing, education, health access, social vulnerability, disaster exposure, and access to public services. In this context, big data offers a strategic opportunity for local governments to strengthen the quality of regional planning by combining administrative data, population records, geospatial information, social assistance databases, service-use data, public complaint data, and digital traces into a more comprehensive evidence base for policymaking [1], [2].

The urgency of big data utilization in regional development planning is closely related to persistent weaknesses in conventional planning systems. Many local governments still face fragmented databases, inconsistent sectoral indicators, weak data validation, limited interoperability among agencies, and planning documents that are not always supported by reliable empirical evidence. Development programs may become less targeted when poverty data, social assistance records, village-level information, and basic-service indicators are not integrated into a single analytical framework. Evidence-based policy requires government decisions to be grounded in credible data, rigorous analysis, and contextual interpretation rather than administrative habit or short-term political preference. Big data can support this process by enabling local governments to identify development problems more precisely, classify vulnerable groups, detect service gaps, evaluate program outcomes, and improve the targeting of public intervention [3], [4]. It also strengthens the logic of data-driven governance, where planning, budgeting, implementation, monitoring, and evaluation are connected through continuous evidence flows [5].

Big data is particularly relevant for poverty alleviation, social assistance, and basic-service planning because these policy areas require high accuracy in identifying beneficiaries, locations, needs, and risks. In social assistance programs, inaccurate data may produce exclusion errors, where eligible poor households are not included, and inclusion errors, where non-eligible households receive benefits. In basic services, weak data integration may lead to unequal distribution of schools, health facilities, sanitation programs, housing assistance, and public infrastructure. Machine learning and spatial data have been increasingly used in poverty targeting and welfare estimation, demonstrating that alternative data sources such as satellite imagery, mobile-phone data, high-resolution poverty maps, and household-level administrative records can improve targeting when used carefully [17], [18]. Yet, these tools also raise concerns regarding fairness, privacy, local validity, and the risk of treating technical prediction as a substitute for democratic policy judgment. For this reason, big data must be positioned as an instrument for strengthening evidence-based policy, not as an automatic mechanism for replacing public deliberation.

Recent studies have provided important foundations for understanding the relationship between big data, public policy, and digital governance. Hossin et al. [1] show that big data analytics can support public policy across planning, design, service delivery, supervision, and feedback stages. Chao et al. [2] demonstrate that big data-driven policymaking can improve fact-based and rapid decision-making in public health, a sector that is highly relevant to regional development and basic-service planning. Mills et al. [5] examine evidence-based public policy decision-making in smart cities and emphasize that better evidence can support urban sustainability, although excessive reliance on big data and artificial agents may weaken collaborative decision-making. Wirtz et al. [6] review empirical research on open government data and show that open data has significant potential for public-sector innovation, transparency, and digital economy development. Begany and Gil-Garcia [7] further argue that open government data initiatives can become agents of digital transformation in the public sector when their actual use is institutionally supported. Shah et al. [8] propose a data lifecycle framework for data-driven governments, while Wook et al. [9] highlight the importance of data quality dimensions in big data analytics applications.

Other studies have examined data-driven government and digital technology adoption at the local level. Sayogo et al. [3] show that data-driven decision-making in Indonesian local government depends on the ability to transform quality data into knowledge, supported by capable people, appropriate tools, institutional culture, and regulatory context. Ariansyah et al. [4] develop a big data readiness assessment model for Indonesian local governments and emphasize that readiness is shaped by organizational, technological, and environmental factors. Criado et al. [10] discuss digital public services as a form of innovation in public administration, while Verma [11] explains that sentiment analysis of public services can help governments understand citizen needs, perceptions, and service experience. David et al. [16] review local government digital technology adoption strategies and identify the importance of people, process, and technology alignment. In the field of poverty and social protection, Aiken et al. [17] show that machine learning and phone data can improve humanitarian aid targeting, Smythe and Blumenstock [18] demonstrate the relevance of high-resolution poverty maps for social assistance microtargeting, Beuermann et al. [19] evaluate targeting tools for social programs under fluctuating income conditions, and Schnitzer and Stoeffler [20] compare targeting mechanisms in social safety-net programs. These studies collectively confirm that data can improve policy accuracy, but they also show that data quality, administrative capacity, and institutional accountability remain decisive.

Although previous research has examined big data analytics in public policy, open government data, data-driven government, digital public services, and poverty targeting, there remains a gap in explaining how big data can be integrated specifically into **regional development planning** as an evidence-based policy framework at the local government level. Much of the existing literature discusses big data as a general public-sector innovation or as a technical instrument for prediction and targeting. Fewer studies connect big data directly with the managerial cycle of local development planning, including problem identification, program formulation, poverty alleviation, social assistance targeting, basic-service planning, monitoring, and evaluation. This study addresses that gap by analyzing the utilization of big data in regional development planning and by proposing an evidence-based local policy framework that connects data integration, analytical capacity, program prioritization, accountability, and citizen-oriented development outcomes. The study aims to explain how big data can strengthen evidence-based policy in local government, particularly in planning development programs, reducing poverty, improving social assistance accuracy, and enhancing basic public services.

2. RESEARCH METHODS

This study employs a **qualitative research design** with an **exploratory-descriptive approach** and **conceptual framework development**. The qualitative approach is used because the study does not aim to measure statistical causality or test the technical performance of a specific big data algorithm. Instead, it seeks to understand how big data can be utilized by local governments to strengthen evidence-based policy in regional development planning. The exploratory-descriptive approach allows the study to examine the relationship between data availability, planning processes, poverty reduction programs, social assistance targeting, and basic-service improvement. Conceptual framework development is used because the main contribution of this study is to formulate a local

government planning model that integrates big data, evidence-based policy, institutional coordination, and public accountability.

The case study of this research focuses on **big data utilization in local government development planning**. Local government is selected as the main unit of analysis because it has direct responsibility for preparing regional development plans, identifying community needs, allocating public programs, reducing poverty, distributing social assistance, and improving basic services such as health, education, housing, sanitation, and infrastructure. The study examines big data sources that are relevant to regional planning, including population administration data, poverty databases, social assistance records, geospatial data, public-service data, village-level data, health and education indicators, public complaint data, and digital citizen feedback. These data sources are analyzed in relation to how local governments can use them to identify development problems, determine program priorities, target beneficiaries, monitor service gaps, and evaluate policy outcomes.

The data used in this study are collected from **secondary and documentary sources**. The main sources consist of peer-reviewed journal articles published within the last five years, official government documents, regional planning documents, policy reports, regulatory materials, institutional publications, and studies related to big data, evidence-based policy, local government planning, poverty reduction, social assistance, and basic public services. Data collection is conducted through document identification, relevance screening, thematic classification, and content analysis. The data are analyzed using **qualitative thematic analysis** by classifying the findings into several main themes: big data integration in regional planning, evidence-based program formulation, poverty and vulnerability mapping, social assistance targeting, basic-service improvement, institutional readiness, data governance, and public accountability. The results of this analysis are used to construct an evidence-based local development planning framework that positions big data as a strategic instrument for improving the accuracy, responsiveness, and accountability of local government policy.

3. RESULTS AND DISCUSSION

a. Big Data Integration in Regional Development Planning

The findings show that big data can strengthen regional development planning by improving the accuracy, completeness, and timeliness of evidence used by local governments. In conventional planning systems, development priorities are often formulated through sectoral reports, annual administrative data, and routine planning consultations. While these mechanisms remain important, they are frequently limited by fragmented datasets, delayed reporting, inconsistent indicators, and weak inter-agency interoperability. Big data offers a more integrated evidence base by combining population administration data, poverty databases, social assistance records, geospatial information, health and education indicators, infrastructure data, village-level data, public complaint records, and citizen feedback from digital platforms. When these data sources are systematically integrated, local governments can identify development problems more precisely and formulate programs based on real social, spatial, and economic conditions.

The analysis indicates that big data supports the shift from administrative planning toward **evidence-based development planning**. This shift is important because regional development problems are often uneven across territories and social groups. Poverty, inadequate housing, limited access to health facilities, low school participation, and infrastructure gaps may appear differently between urban, rural, coastal, mountainous, and disaster-prone areas. Big data allows local governments to map these variations more accurately through spatial analytics, service-use patterns, and vulnerability indicators. This finding is consistent with Hossin et al. [1], who argue that big data-driven policy can transform public decision-making by improving planning, policy design, service delivery, supervision, and public feedback. It also supports Mills et al. [5], who emphasize that evidence-based public policy in smart cities requires decision-makers to use data not only for efficiency, but also for sustainability, inclusion, and long-term public value.

The findings also show that big data integration requires strong institutional arrangements. Local governments cannot rely only on the existence of digital applications or databases. Data must be standardized, validated, shared, and interpreted through coordinated planning mechanisms. Without data governance, big data may produce confusion instead of clarity, especially when different agencies use different definitions, indicators, and beneficiary lists. This is in line with Sayogo et al. [3], who explain that data-driven decision-making in Indonesian local governments depends on data quality, human capability, institutional culture, and regulatory support. Ariansyah et al. [4] also show that big data readiness in Indonesian local governments is influenced by organizational, technological, and environmental factors. These studies confirm that the use of big data in regional planning must be accompanied by institutional readiness, data governance, analytical capacity, and inter-agency collaboration.

b. Big Data for Poverty Reduction, Social Assistance, and Basic-Service Improvement

The second finding shows that big data has significant potential to improve poverty reduction programs and social assistance targeting. Local governments often face difficulties in determining eligible beneficiaries because poverty conditions are dynamic, multidimensional, and affected by household income, employment, health status, education level, housing condition, disability, disaster exposure, and family vulnerability. Static and outdated poverty

data may cause exclusion errors, where poor households are not included in assistance programs, and inclusion errors, where non-eligible households receive benefits. Big data can reduce these problems by integrating household data, population records, social assistance history, village-level verification, geospatial poverty maps, and service-access indicators. This integration allows local governments to update poverty profiles more frequently and design programs that are more responsive to real community needs.

The discussion is closely related to recent studies on data-driven poverty targeting. Aiken et al. [17] show that machine learning and mobile-phone data can improve the targeting of humanitarian aid, particularly when conventional household survey data are limited. Smythe and Blumenstock [18] also demonstrate that high-resolution poverty maps can support geographic microtargeting of social assistance. Beuermann et al. [19] explain that targeting tools for social programs must account for income fluctuation because poverty status can change over time. Schnitzer and Stoeffler [20] add that social safety-net targeting requires careful design to reduce errors and improve program effectiveness. These studies confirm that data-driven targeting can improve policy accuracy, but they also indicate that technical prediction should not replace local verification, social judgment, and administrative accountability.

Big data also supports the improvement of basic public services by helping local governments identify service gaps in health, education, housing, sanitation, transportation, and public infrastructure. For example, geospatial and demographic data can be used to determine areas with limited access to schools or health facilities. Public complaint data can reveal recurring service failures, while digital feedback can help governments understand citizen satisfaction and service barriers. Sentiment analysis and public-service analytics are useful for capturing citizen perceptions and identifying service problems that may not appear in formal bureaucratic reports. Verma [11] notes that sentiment analysis of public services can help governments understand public needs and service experiences. Criado et al. [10] also explain that digital public services represent a form of administrative innovation when they are connected to service improvement and institutional learning. These findings support the argument that big data should be used not only for planning documents, but also for monitoring whether development programs actually improve citizens' access to essential services.

c. Evidence-Based Local Policy Framework and Governance Implications

The main result of this study is the formulation of an **evidence-based local development planning framework** that positions big data as a strategic instrument in the policy cycle. The proposed framework consists of five interconnected dimensions: **data integration, analytical interpretation, program prioritization, accountable implementation, and continuous evaluation**. Data integration refers to the ability of local governments to connect various datasets from different sectors and administrative levels. Analytical interpretation refers to the capacity to transform raw data into policy-relevant knowledge. Program prioritization refers to the use of evidence to determine which areas, groups, and sectors require urgent intervention. Accountable implementation ensures that data-driven programs remain transparent, fair, and open to public scrutiny. Continuous evaluation allows government institutions to monitor program performance, update policy assumptions, and revise development strategies based on new evidence.

This framework contributes to previous research by connecting big data with the practical logic of local government planning. Previous studies have discussed big data in public policy, open government data, public-sector digital transformation, and poverty targeting [1], [6], [7], [17], [18]. This study extends those discussions by emphasizing that big data becomes meaningful for local government only when it is embedded in the planning cycle, from problem identification to evaluation. Open data and digital transformation are important, but their value depends on whether data are actually used in policy formulation and program decisions. Wirtz et al. [6] show that open government data can support innovation and transparency, while Begany and Gil-Garcia [7] emphasize that open data initiatives can become agents of public-sector digital transformation when they are institutionally used. The findings of this study support these arguments and add that big data must be connected to evidence-based policy practices in regional development planning.

The findings also reveal several governance implications. First, local governments need integrated data governance that regulates data standards, data sharing, data validation, privacy protection, and institutional responsibility. Second, planners and public officials need stronger data literacy so that they can interpret big data critically and avoid misleading conclusions. Third, evidence-based policy must remain connected to public participation because quantitative data may not fully capture lived experiences, local knowledge, and community priorities. Fourth, big data use must be guided by ethical and accountable governance, particularly in poverty and social assistance programs where data errors can directly affect vulnerable citizens. Shah et al. [8] argue that data-driven government requires a complete data lifecycle framework, while Wook et al. [9] emphasize that data quality is essential for big data analytics applications. These perspectives confirm that big data can strengthen evidence-based policy only when supported by reliable data quality, institutional coordination, ethical safeguards, and citizen-oriented governance.

Based on the overall analysis, this study finds that big data can help local governments move from routine planning toward adaptive and evidence-based regional development governance. Its value lies not only in the volume

of data collected, but in the ability of local governments to integrate, interpret, and use data for public decision-making. Big data can improve the accuracy of poverty reduction programs, social assistance distribution, and basic-service planning. It can also strengthen monitoring and evaluation by providing continuous feedback on program performance. Yet, the success of big data utilization depends on institutional readiness, inter-agency collaboration, data quality, analytical competence, privacy protection, and accountability mechanisms. For this reason, evidence-based policy at the local government level should be understood as a governance process that combines data intelligence, administrative responsibility, public participation, and development justice.

4. CONCLUSION

This study finds that big data can strengthen regional development planning by improving the quality, accuracy, and responsiveness of evidence used by local governments. The findings show that regional planning becomes more effective when population data, poverty databases, social assistance records, geospatial information, public-service indicators, village-level data, citizen complaints, and digital feedback are integrated into one policy-oriented data ecosystem. Through this integration, local governments can identify development problems more precisely, determine priority areas, map vulnerable groups, reduce errors in social assistance targeting, and monitor gaps in basic services such as health, education, housing, sanitation, and infrastructure.

The study also shows that the utilization of big data in local government is not merely a technical matter, but a managerial and institutional process. Big data can support evidence-based policy only when local governments have reliable data governance, inter-agency coordination, analytical capacity, data-literate public officials, and clear accountability mechanisms. Without these conditions, large volumes of data may produce fragmented information, inconsistent policy interpretation, and inaccurate development programs. The findings confirm that big data must be connected to the full regional planning cycle, from problem identification and program formulation to implementation, monitoring, and evaluation.

The main novelty of this study lies in the formulation of an **evidence-based local development planning framework** that links big data with the practical logic of local government planning. The proposed framework consists of five dimensions: data integration, analytical interpretation, program prioritization, accountable implementation, and continuous evaluation. This framework extends previous studies on big data-driven policy, open government data, digital public services, and poverty targeting by placing big data within the managerial cycle of regional development planning. The study emphasizes that big data is valuable not only because it increases the volume of information, but because it helps local governments transform data into public policy knowledge.

The findings imply that evidence-based policy at the local government level requires a balance between data intelligence and democratic governance. Big data can improve the accuracy of planning and social assistance, but it should not replace public participation, local knowledge, and administrative responsibility. Poverty, vulnerability, and service inequality cannot be fully understood through digital data alone. Local governments still need community verification, deliberative planning, and ethical safeguards to prevent data bias, privacy violations, and exclusion of vulnerable citizens.

This study has limitations because it uses a qualitative and documentary-based approach. The proposed framework has not yet been tested through direct fieldwork, interviews with local government planners, or empirical evaluation of regional planning practices. Future research should examine the application of this framework in specific local governments, especially in poverty reduction programs, social assistance reform, basic-service planning, or regional development monitoring systems. Further studies may also use mixed methods by combining document analysis, interviews, surveys, spatial data analysis, and policy-performance indicators to measure how big data affects planning accuracy, program effectiveness, citizen satisfaction, and public accountability.

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