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Improving Human Development Index (HDI) through Education Spending in Bogor Regency

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Abstract:

The improvement of the Human Development Index (HDI) in the education dimension heavily relies on the achievements of Expected Years of Schooling (EYS) and Mean Years of Schooling (MYS). Bogor Regency, one of the most populous regions in Indonesia, faces critical challenges in accelerating progress in both indicators. This study aims to analyze the underlying factors of the suboptimal improvement in EYS and MYS through local government spending and to formulate appropriate strategies to enhance the effectiveness and equity of education budget allocation. The research employs a mixed-methods approach using descriptive analysis, SWOT, and the Analytical Hierarchy Process (AHP). Data collection was conducted through document review, in-depth interviews with key informants, and structured AHP-based questionnaires administered to local stakeholders. The findings reveal that the unequal distribution of secondary schools, shortage of civil servant teachers, and limited access to education in remote areas are the primary constraints. The AHP analysis identifies internal weaknesses as the most influential factor hindering educational outcomes. Strategic recommendations emphasize the equitable development of junior secondary schools, capacity-building and equitable placement of teachers, and the advancement of spatial data-driven budget planning systems. The results underscore the necessity for cross-sectoral integration and stakeholder engagement in evidence-based education policy formulation. This study contributes to the development of a more adaptive, participatory, and outcome-oriented strategic framework for regional education development aimed at enhancing the quality of human capital.

Keywords : *Human Development Index; Expected Years of Schooling; Mean Years of Schooling; Local Government Spending; Education*

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1. Introduction

Human development is a fundamental pillar in achieving public welfare and sustainable regional progress. The Human Development Index (HDI) serves as a comprehensive indicator to evaluate a region's success in enhancing its population's quality of life through three dimensions: health, education, and standard of living. Among these, education is widely acknowledged as the most strategic and foundational element, as it shapes the development of human capital and determines the long-term socio-economic trajectory of a region (Arapova, 2022; Singh et al.,

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2025). Education not only empowers individuals with knowledge and skills but also functions as a key driver in reducing poverty, promoting equity, and fostering inclusive economic growth (Al Mamun & Rahim, 2025).

In the context of Bogor Regency—one of Indonesia's most densely populated and economically active regions—efforts to enhance HDI have shown a gradual upward trend. However, when disaggregated, the educational indicators within HDI reveal persistent weaknesses. Data from Statistics Indonesia (BPS) for 2024 indicate that the Expected Years of Schooling (EYS) stands at 12.75 years, marginally below the national target of 13.00 years, while the Mean Years of Schooling (MYS) lags further behind at 8.39 years, short of the 9.0-year target set by the RPJMN. This suggests that while the regency may be making quantitative strides, the qualitative dimension of education—and its effectiveness in enhancing human development—remains underwhelming (Setyaningrum, 2024; Maharda & Aulia, 2020).

A major determinant of educational performance in local contexts is the pattern and efficacy of public expenditure. Bogor Regency has complied with the constitutional mandate of allocating at least 20% of its regional budget to education. Yet, the persistence of infrastructure inequality, budget inefficiencies, and excessive routine spending suggests a mismatch between budgetary inputs and developmental outcomes (Widodo et al., 2021; Nurvita et al., 2022). Previous studies have emphasized that not only the quantity but the quality and strategic alignment of education spending are critical in driving improvements in EYS and MYS (Yogiantoro et al., 2019; Suhaili et al., 2020).

Despite the growing body of literature on education spending and HDI, a research gap remains in localized, regency-level analysis that critically examines the micro-dynamics of public spending and its influence on educational indicators. Most existing studies focus on national or provincial aggregates, leaving sub-regional variations underexplored (Nurfitriani & Hartarto, 2018; Widodo et al., 2021). This limits the policy relevance of findings for decision-makers at the municipal or district level.

This study seeks to fill that gap by focusing specifically on Bogor Regency as a case study. The novelty of this research lies in its integrative approach, combining quantitative analysis of regional education expenditure with HDI performance metrics and qualitative insights into budgetary priorities and governance mechanisms. By linking disaggregated educational outcomes (EYS and MYS) to patterns of spending, this study contributes to a more granular understanding of how local governments can enhance human capital development through more targeted fiscal strategies (Setyaningrum, 2024; Singh et al., 2025).

The urgency of this research is underscored by the need to support regional governments in achieving national development targets and SDG-4 on quality education. Without significant improvements in education quality and access, Bogor Regency may face long-term developmental stagnation, particularly given its demographic pressures and socio-economic complexity (Al Mamun & Rahim, 2025;

Nurvita et al., 2022). Therefore, the insights generated from this study are expected to inform more efficient and effective education spending frameworks, ultimately advancing HDI at the local level.

2. Theoretical Background

Policy Review: Law No. 23 of 2014 on Regional Government stipulates that education and health are essential public service responsibilities of local governments (Article 12, Paragraph 1). It mandates a minimum allocation of 20% of the Regional Budget (APBD) for education and 10% for health (Article 298). Furthermore, regional development strategies must consider territorial size, population, and geographic characteristics (Article 50 and Article 14, Paragraph 1). Government Regulation No. 12 of 2019 reinforces these mandates, requiring local governments to allocate at least 20% of their budgets to education and 10% to health (Article 9). Article 11 further emphasizes the importance of transparent and accountable fiscal management to support the delivery of essential public services.

Public and Regional Development Administration: Public administration focuses on how governments formulate and implement policies to serve public needs effectively. Rooted in Weber's bureaucracy theory emphasizing hierarchy and rules (Flynn & Asquer, 2022), the field has evolved through New Public Management (NPM), which promotes efficiency and performance using private-sector principles (Edward et al., 2024). In response to its limitations, good governance emerged to stress transparency, accountability, and citizen participation (Arapova 2022), while decentralization enables local governments to tailor services to local needs (Majid, 2023). This intersects with regional development administration, which manages policy and resource allocation to improve welfare. Modernization theory highlights state-led structural transformation for growth (Kuncoro, 2023), whereas dependency theory warns of global inequalities and advocates for domestic economic resilience (Obuah & Komi, 2023). Together, these frameworks guide strategic and inclusive policy implementation at the regional level.

Human Development Index (HDI): Human development theory has evolved significantly, shifting from a focus on economic growth and industrialization as the primary indicators of progress to a more holistic approach that emphasizes social welfare and quality of life. Initially, economic growth was viewed as the key driver of national advancement, but this approach was later criticized for overlooking essential human aspects such as health, education, and social well-being. As Bangun (2021) notes, economic growth without adequate human resource development exacerbates social inequalities. The paradigm shift towards human-centered development emphasizes investing in human capital through education, healthcare, and skill development, which are essential for sustainable and competitive growth (Bangun, 2021; Haryanto & Siswanta, 2021). Additionally, the participatory approach, which empowers local communities and utilizes local knowledge and resources, plays a crucial role in ensuring that development initiatives align with the specific needs of the population (Haryanto & Siswanta, 2021). This perspective

advocates for direct involvement of the community in decision-making, emphasizing that sustainable development must involve people at all levels.

In Indonesia, implementing human development theory faces several challenges, including gender inequality, poverty, and regional disparities. These challenges necessitate a development strategy tailored to local conditions, considering the socio-cultural and economic context. According to Gani and Nurmiati (2023), human resource development planning must be competency-based and adaptable to digital advancements. A holistic approach to human development is vital for fostering inclusive and sustainable progress. The focus is not only on improving material wealth but also on empowering individuals and communities to reach their full potential. The success of human development is reflected in indices such as HDI, which integrates health, education, and living standards as key indicators. By addressing the multi-dimensional aspects of development, human development theory provides a comprehensive framework for improving the overall quality of life across various sectors, ensuring that growth benefits are widely shared and accessible.

Regional Expenditure: Regional spending, part of the Regional Revenue and Expenditure Budget (APBD), finances local government affairs, reflecting the commitment to public services, development programs, and governance functions. According to Minister of Home Affairs Regulation No. 77 of 2020, it includes all non-reimbursable expenditures for the year. It is divided into operating expenses (e.g., salaries, goods, and services) and capital expenditures (e.g., fixed assets). Regional spending serves strategic functions: allocation to fund public services, distribution to promote welfare via subsidies and grants, and stabilization to regulate regional economic stability through fiscal policies.

Definition of Strategy: Strategy, as defined by Setyaningrum (2024), is the outcome of carefully selecting a series of actions or methods aimed at achieving one or more predetermined objectives. It is often viewed as a set of actions undertaken by an organization to achieve superior performance. Singh et al., (2025) expands on this by explaining that strategy encompasses a company's long-term goals and the use and allocation of essential resources to achieve these goals. Strategy serves as a means to help organizations objectively assess environmental changes and respond accordingly, acting as a plan devised by top management to achieve desired outcomes. This plan includes objectives, policies, and actions necessary for the organization to sustain its existence and excel in competitive environments. Rangkuti (2017) identifies three types of strategies: management strategy, investment strategy, and business strategy. Management strategy involves large-scale planning and development, such as financial strategies, pricing, product development, acquisitions, and market expansion. Investment strategy focuses on activities related to investments, including aggressive growth, market expansion, and diversification. Business strategy, often referred to as functional strategy, centers on specific management functions like marketing, production, distribution, and finance. Overall, strategy enables organizations to effectively pursue their goals by aligning strengths

with external opportunities and adapting to evolving circumstances (Setyaningrum 2024; Rangkuti, 2017).

SWOT-AHP Analysis: SWOT analysis is widely used to formulate strategic responses based on internal strengths and weaknesses as well as external opportunities and threats. The resulting strategies—SO, ST, WO, and WT—guide policymakers in designing contextually appropriate interventions (Rangkuti, 2017). This method is particularly useful for regions facing diverse and complex development challenges. To enhance strategic decision-making, AHP can be integrated with SWOT. Developed by Thomas Saaty, AHP employs pairwise comparisons and hierarchical structuring to determine priorities among alternatives (Kulakowski, 2020). It provides a quantitative basis for policy evaluation and planning (Ginting et al., 2020; Marsono, 2020). The combination of SWOT and AHP forms a robust framework for formulating regionally relevant and evidence-based development strategies. This approach is especially relevant for addressing education-related components of HDI, such as EYS and MYS, in Bogor Regency. The application of SWOT-AHP allows local governments to optimize education spending by aligning policies with measurable development targets.

3. Methodology

This study adopts a mixed-methods approach, integrating both quantitative and qualitative methodologies. This combination facilitates the formulation of strategies that are not only objective and measurable but also grounded in a deep understanding of the local context. Descriptive analysis is employed to portray the current conditions of two key educational indicators—HLS and RLS—in Bogor Regency. The SWOT analysis is utilized to identify internal factors (strengths and weaknesses) and external factors (opportunities and threats) relevant to enhancing the HDI. To ensure a data-driven prioritization of strategies, the Analytical Hierarchy Process (AHP) is used to assign objective weights to the SWOT factors based on their relative importance.

Bogor Regency is selected as the study area due to its complex development challenges and its strategic significance in the HDI dynamics of West Java Province. The research was conducted over a period of one to six months to ensure the acquisition of accurate and representative data. The core objects of analysis in this study include the HLS and RLS indicators, along with the allocation of local government spending in the education sector within Bogor Regency. The primary focus is on identifying optimal strategies for improving the effectiveness of local education expenditure that can significantly impact educational outcomes. A comprehensive understanding of the characteristics and trends of HLS and RLS is essential for developing contextual and relevant policy recommendations that support sustainable human development in the region.

Data collection employs a triangulation technique, integrating both primary and secondary sources to ensure analytical depth and validity. Primary data are obtained through structured questionnaires and in-depth interviews with key informants from

relevant agencies such as Bappedalitbang (Regional Development Planning Agency), the Department of Education, and principals of public primary and junior secondary schools. Secondary data are drawn from authoritative sources, including publications from Statistics Indonesia (BPS), the Regional Medium-Term Development Plan (RPJMD), strategic plans (Renstra), and performance reports from local government agencies, thereby reinforcing the validity of research findings.

The data analysis is carried out in two main stages: descriptive analysis and integrated SWOT-AHP analysis. Descriptive analysis is applied in the initial phase to examine the characteristics and trends of HLS and RLS using basic statistical tools. These results serve as the foundation for identifying factors influencing HDI improvement. The subsequent phase involves identifying SWOT factors through literature reviews, surveys, and expert consultations. A hierarchical structure is then developed for the AHP analysis, encompassing the primary objective, SWOT criteria, and specific sub-criteria. The AHP questionnaire employs pairwise comparisons based on the Saaty scale, and priority weights are calculated using the geometric mean of respondents' assessments. A consistency test (Consistency Ratio/CR < 0.1) is applied to ensure logical coherence, while data validity is reinforced through source and method triangulation, as well as expert validation of the questionnaire content. These steps collectively ensure the reliability and robustness of the findings in formulating strategies for optimizing education expenditure.

4. Empirical Findings/Result

This section presents a condensed analysis of research findings regarding the optimization of regional expenditure to improve EYS and MYS in Bogor Regency, key components of the HDI.

Factors Sub-optimally Affecting EYS and MYS Improvement
HDI, EYS, and MYS Conditions in Bogor Regency
Bogor Regency's HDI in 2024 was 73.63, an increase from 2023, yet below West Java and national averages. This disparity signals structural issues in equitable access to education and health. Significant inter-sub-district inequalities persist, particularly in peripheral areas facing geographical and infrastructural limitations. As one official noted, *"Sub-districts like Sukajaya and Nanggung face severe geographical constraints... schools are distant, roads are damaged".*

EYS increased to 12.75 years in 2024, below the national target of 13.0 years, with significant sub-district disparities (up to 5.89 years difference). Limited secondary school infrastructure and geographical barriers were key constraints. A school principal stated, *"Many children do not continue... because access is far and transportation costs are high".*

MYS reached 8.39 years in 2024, also below the national target of 9.0 years, with inter-sub-district gaps of up to 5.18 years. Low MYS in areas like Sukajaya (5.95 years) is linked to limited junior high school availability and preferences for early

work or marriage. A Bappeda representative noted, *"Low MYS... is also caused by high dropout rates... as they prefer to work or marry early".*

Education Sector Conditions

While overall teacher quality is considered adequate—partly due to the availability of training programs—significant disparities remain in teacher distribution and employment status. Many elementary schools still rely heavily on non-permanent teaching staff and experience a shortage of definitive school principals. *"The number of civil servant (ASN) teachers is very insufficient,"* reported one elementary school principal. In addition, numerous elementary schools suffer from physical damage and inadequate facilities, further constraining the learning environment. Accessibility to schools remains limited in certain regions, and there is a structural imbalance between elementary and junior high schools, with an average ratio of 2.43 elementary schools per junior high school. This indicates a shortfall of approximately 107 junior high schools across 20 sub-districts, highlighting a critical gap in educational infrastructure.

Regional Education Expenditure

In 2024, 28.85% (IDR 2.74 trillion) of regional expenditure was allocated to education, exceeding the 20% minimum. However, fiscal deficits led to rationalization, cutting the education budget by up to 50%, affecting priority programs like new classroom construction. Challenges include budget deficits, mismatch between allocations and real needs, low planning quality, and political pressure on budget allocation. *"When a deficit occurs, our classroom construction projects are canceled,"* stated an Education Office official.

Identification of SWOT Factors

The SWOT analysis was developed based on the state of education in Bogor Regency to identify specific factors in efforts to optimize regional spending to improve HLS and RLS. These factors are based on the current conditions, challenges, and potential identified earlier. The following are the results of the SWOT factor identification in this study:

- **Strengths**: (S1) Significant education budget allocation in the regional budget (APBD) of Bogor Regency; (S2) Teacher training and competency development programs; (S3) Availability of scholarship programs for formal and non-formal education; (S4) Utilization of digital systems in education management.
- **Weaknesses**: (W1) Disparity in educational infrastructure between regions; (W2) Dependence on central government funds; (W3) Imbalance in the number of elementary and junior high schools in each sub-district; (W4) Lack of civil servant teachers and permanent school principals.
- **Opportunities**: (O1) National policy support for education improvement; (O2) Technological advancements for education digitization; (O3) Increasing school-age population; (O4) Affirmative programs from the central government for underdeveloped areas.
- **Threats**: (T1) Regional budget deficits leading to cuts in education spending; (T2) Political pressure in the allocation of education funds; (T3) Potential

changes in central government education policies; (T4) Limited access to quality education in remote areas.

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AHP Analysis Results (Main Criteria and Sub-criteria of SWOT)

A comparison analysis of the main criteria (Strength, Weakness, Opportunity, Threat) was conducted using the AHP model with seven stakeholder respondents (Bappedalitbang, Education Department, School Principals), and data were aggregated using the Geometric Mean. The pairwise comparison matrix for the main criteria indicated relative preferences, with the Weakness (W) criterion receiving the highest priority weight (0.537), followed by Threat (T) (0.305), Opportunity (O) (0.103), and Strength (S) (0.055). For sub-criteria, in the Strength category, S3 (Scholarship programs) had the highest local weight (0.427), while S1 (Budget allocation) had the lowest (0.084); in Weakness, W3 (Imbalance in the number of elementary and junior high schools) was highest (0.364), and W2 (Dependency on central government funding) was lowest (0.060); in Opportunity, O3 (School-age population growth) had the highest weight (0.358), while O4 (Central government affirmation programs) had the lowest (0.167); in Threat, T4 (Limited access in remote areas) had the highest weight (0.661), and T1 (Budget deficit) had the lowest (0.058).

The AHP results were validated using the Consistency Index (CI) and Consistency Ratio (CR), with a Random Index (RI) of 0.90 (n=4). All CR values were below 0.10, indicating consistency in the assessments, with the highest CR in the Opportunity sub-criteria (0.069) and the lowest in the Strength sub-criteria (0.010), reinforcing the reliability of the weighting results.

Interpretation of AHP Results (Priority of Key Factors)

Weaknesses (W) and Threats (T) emerge as the primary focus areas for strategy, as they have the greatest influence compared to Opportunities (O) and Strengths (S). The utilization of opportunities and strengthening of strengths are prioritized lower. The analysis of sub-criteria offers critical guidance in formulating strategic focus. Table 1 below highlights the key factors with the highest and lowest global weights. Table 1. Global Weight of SWOT Factors.

Based on Table 1, the Strength sub-criterion (S2), with a global weight of 0.215, ranks the highest, indicating that teacher capacity building is the most fundamental and urgent intervention. The next highest-ranked sub-criteria are Threats (T4 and T2), with global weights of 0.202 and 0.106, highlighting that geographic disparities and political influence on budgeting are significant obstacles. The Opportunity sub-criterion (O2) reflects the substantial potential for leveraging information and communication technology (ICT), with a global weight of 0.097. The Weakness sub-criterion (W4) emphasizes the need to address the quantity and status of staffing, with a global weight of 0.085. The top five factors represent 70.5% of the total global weight, suggesting that strategic interventions and regional budget allocation should be concentrated in these areas. Other factors such as O3 (school-age population growth), O4 (central government affirmation programs), and S3 (scholarship programs) also require attention as supporting elements. Factors with low global weights, such as S1 (significant budget allocation) and T1 (budget deficit), indicate

that allocation amounts do not necessarily reflect effectiveness; efficient use and risk mitigation are more critical.

Table 1. Global Weight of SWOT Factors

Rank	Sub-Criteria Code	Sub-Criteria Description	Global Weight
1	S2	Teacher training and development programs	0.215
2	T4	Limited access to quality education in remote areas	0.202
3	T2	Political pressure in determining education budget allocation	0.106
4	O2	Technological advancement for educational digitalization	0.097
5	W4	Shortage of civil servant teachers and permanent principals	0.085
15	S1	Significant education budget allocation in the APBD of Bogor	0.005
16	T1	Regional budget deficit causing cuts in education spending	0.003

Source: 2024 processed original data

Strategic Alternatives and Implications

Strategy Formulation for Enhancing HDI through Education

Strategic alternatives are formulated to optimize regional spending by focusing on addressing the most significant weaknesses and threats while leveraging the most crucial strengths and opportunities. A combination of various strategic elements holds the potential for optimal outcomes, with the global weights of AHP sub-criteria serving as the foundation for these formulations.

- Strategy 1: Improving Teacher Competence for Remote Areas with Digital Support (ST - S2 + T4, supported by O2). This strategy targets T4 (the most significant threat) and S2 (a major strength), supported by O2 (a key opportunity). Technology reduces logistical costs and enhances reach.
- Strategy 2: Accelerating Teacher/Principal Appointments and Placement in Remote Areas (WT - W4 + T4). Addressing W4 (a critical weakness) in the context of T4 (the most significant threat), this strategy prioritizes spending on incentives and recruitment/placement of human resources in remote areas.
- Strategy 3: Strengthening Education Budget Resilience Against Political Pressure through Special Allocation (ST/WT - T2 combined with S2/W4). This strategy addresses T2 (a significant threat) by ensuring a more robust and protected budget allocation mechanism for priority programs (S2, addressing W4).
- Strategy 4: Leveraging Digital Technology for Equalizing Access and Education Quality (WO - W1 + O2, also supporting T4). Utilizing O2 (a crucial opportunity)

to address W1 (a significant weakness) and T4, this strategy emphasizes digital solutions that surpass physical infrastructure limitations.

- Strategy 5: Developing Teacher Training Programs Based on the Needs of Remote Areas (SO - S2 + T4). This strategy elaborates on leveraging S2 to address T4 with a focus on relevance. The training materials and methods are tailored to meet the unique challenges of remote areas.

Strategy Implications for Regional Spending

The results of the AHP analysis and strategic alternatives serve as evidence-based guidance for optimizing regional spending allocation and utilization to enhance HLS and RLS. Spending optimization is prioritized on key factors.

- Strategy 1 (Improving Teacher Competence in Remote Areas with Digital Support): Spending focuses on teacher training programs in remote areas using digital technology, providing digital learning resources, distance mentoring, and basic digital infrastructure.
- Strategy 2 (Accelerating Teacher/Principal Appointments and Placements in Remote Areas): Spending prioritizes recruitment, selection, special incentives (such as allowances and housing), and the improvement of official residences in remote areas.
- Strategy 3 (Strengthening Education Budget Resilience Against Political Pressure): Spending is directed towards developing a strong budgeting mechanism and setting a minimum percentage of education spending specifically for human resource strengthening programs.
- Strategy 4 (Leveraging Digital Technology for Equalizing Access and Education Quality): Spending focuses on providing digital learning platforms, educational content, ICT infrastructure, and training for their use, especially in areas with infrastructure gaps and remote regions.
- Strategy 5 (Developing Teacher Training Programs Based on the Needs of Remote Areas): Spending is directed towards designing and implementing teacher training programs tailored to the unique challenges of remote areas, involving local communities and school supervisors.

Optimizing regional spending emphasizes the effectiveness of budget use to achieve objectives, rather than mere cost-cutting. Public spending is considered optimal when it generates the maximum positive impact. These findings form the basis for work plan formulation, annual budget allocation, and arguments in the Musrenbang and budget discussions in the DPRD. Focusing spending on key factors and supporting relevant strategy implementation is expected to make education spending more targeted, efficient, and contribute significantly to improving HDI.

5. Discussion

This study aligns with prior research emphasizing targeted education spending and strategic planning (e.g., Rachmawati & Saputra, 2022; Wulandari & Wijaya, 2019; Nurvita et al., 2022). Its contribution lies in directly linking regional expenditure optimization to specific EYS and MYS improvement strategies within Bogor

Regency's unique context. Effective implementation requires synergistic collaboration among key stakeholders, including the Education Office, schools, BKPSDM (Regional Civil Service Agency), Bappedalitbang (Regional Development Planning Agency), BPKAD (Regional Financial and Asset Management Agency), and provincial/central education authorities. Prioritizing interventions aimed at actors with the most direct influence on basic education quality and resource distribution is expected to yield the most significant improvements in educational indicators.

The findings of this study show that improvements in Expected Years of Schooling (EYS) and Mean Years of Schooling (MYS) in Bogor Regency still face structural and operational challenges, even though the education budget allocation has met normative targets. This aligns with Singh et al. (2025), who argue that improving human development depends not only on the size of budget allocations but also on the strategic effectiveness of spending, particularly in education and health. Although Bogor Regency allocated 28.85% of its regional budget to education, fiscal deficits caused budget cuts that hindered the implementation of priority programs, such as the construction of new classrooms.

Regional disparities emerged as a key factor behind low EYS and MYS, especially in remote areas like Sukajaya and Nanggung. Physical access to schools and education infrastructure remains limited. This is in line with Al Mamun and Rahim (2025), who found that inequality in access to social services, particularly education, significantly reduces the impact of public sector investments on human development outcomes.

The condition of teaching personnel is also a concern. Despite teacher training programs, the distribution of civil servant teachers remains uneven, and many schools still lack definitive principals. These factors contribute to unstable learning environments. Arapova (2022) emphasizes that government investment in education must be accompanied by improvements in teacher competence and administrative management to effectively stimulate human development.

Based on the AHP analysis, the dominant priorities to address are weaknesses and threats. The high global weights of sub-criteria such as teacher training (S2) and access limitations in remote areas (T4) show the need for policy focus in these areas. Setyaningrum (2024) stresses that enhancing teacher capacity through digital learning tools is a practical and scalable solution to improve education outcomes, especially in geographically challenged regions.

Budgeting decisions in the education sector are also vulnerable to political dynamics (T2), often prioritizing political interests over objective needs assessments. Nurvita et al. (2022) note that budget effectiveness is not only a matter of fiscal capacity but also of governance quality and political will, which often distorts education investment at the local level.

To address these issues, strategic alternatives such as improving teacher competence via digital platforms (ST strategy) and accelerating principal placement in remote

schools (WT strategy) are highly relevant. Maharda and Aulia (2020) argue that digital education reform, when combined with decentralized training, can produce greater returns on education spending compared to traditional infrastructure-focused investments.

This study highlights the importance of evidence-based strategy formulation within Indonesia's decentralized fiscal framework. Widodo et al. (2021) point out that effective planning and localized interventions are critical for translating education spending into tangible HDI improvements across diverse regions.

In terms of novelty, this study integrates SWOT field analysis with AHP to formulate strategic priorities that directly contribute to HDI improvement—an approach that is still rare in Indonesia's district-level education budgeting. Most existing studies focus quantitatively on the relationship between education expenditure and HDI, without diagnosing contextual internal and external factors. Yogiantoro et al. (2019) emphasize that strategic diagnostics at the regional level are crucial to ensure education funds are allocated and implemented efficiently.

Practically, the findings imply that budgeting policies must shift from formalistic compliance to strategic prioritization. Nurfitriani and Hartarto (2018) argue that increased spending alone does not guarantee improvements in human capital without targeted policies that address systemic challenges. Similarly, Suhaili et al. (2020) state that government investment in education will be more effective if directed at human capital development strategies, such as teacher quality, digital access, and management reform.

6. Conclusions

The improvement of Expected Years of Schooling (HLS) and Mean Years of Schooling (RLS) in Bogor Regency has yet to reach its full potential. This is largely due to uneven distribution of educational infrastructure and services between urban and remote areas. Key challenges include a shortage of civil servant teachers and definitive school principals, as well as limited accessibility in isolated regions. Although education receives a relatively high portion of regional spending, inefficiencies in governance, political interference, and minimal use of data-driven planning hinder effective implementation. To address these issues, regional governments must focus on equitable infrastructure development, targeted school construction, and scholarship distribution. Cross-sectoral program integration and improved quality of education spending are essential to achieving more inclusive and measurable educational outcomes.

SWOT-AHP analysis highlights key priority factors such as cross-sector collaboration, access inequality, governance inefficiency, weak data utilization, and digital opportunities. Based on these, several strategic alternatives have been

formulated to improve regional education spending. These include leveraging digital platforms to enhance learning access and teacher quality in remote areas. Another approach involves allocating more funds for recruiting and deploying teachers and principals in underserved districts. Strengthening planning systems to ensure needs-based and stable budget allocation is also critical. Additionally, localized teacher training programs and the integration of digital learning tools can help address disparities. These strategies offer data-informed directions to make regional spending more effective in improving HLS and RLS in Bogor Regency.

The Government of Bogor Regency is advised to prioritize regional education spending on key factors identified through the AHP analysis, particularly improving access to and quality of teachers in remote areas, fulfilling the need for civil servant teachers and permanent school principals, mitigating political pressures in budgeting, and optimizing the use of digital technology and relevant teacher training programs. Implementing these recommendations requires the development of specific, measurable action programs, strengthening coordination among local government units and external stakeholders, and establishing a monitoring and evaluation system based on impact to ensure the effectiveness and accountability of regional spending in improving HLS, RLS, and HDI sustainably. Further research, through evaluating strategies using multi-criteria methods, quantitative analysis of the relationship between regional spending and educational outcomes, as well as comparative studies and best practices, could enrich the foundation for more effective education policies.

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