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The Impact of Education Reforms on Human Capital Development in Sub-Saharan Africa

Wilfred OSITAUFERE[1*], Collins Chidubem UMEGHALU[2], Ezechimere Justice EKPENDU[3], Ngozi Florence EZENWOBI[4]

[1,2,4]Department of Economics, Nnamdi Azikiwe University, Awka, Nigeria
[3]Clifford University, Owerinta, Abia State, Nigeria

Corresponding Author: wilfredositaufere1@gmail.com

Abstract

This research explores how education reforms influence human capital development in Sub Saharan Africa, a region where education is viewed as essential for fostering inclusive growth, boosting productivity, and alleviating poverty. Despite numerous reforms over the years, challenges remain, including low learning outcomes, mismatched skills, and limited returns on educational investments. Analyzing panel data from various Sub-Saharan African nations from 2000 to 2024 using a Panel Autoregressive Distributed Lag (ARDL) model, this study investigates the short-term and long-term relationships among government spending on education, population growth, unemployment, and GDP per capita. The results indicate that while government spending on education positively impacts human capital development in the short term, it appears to have adverse effects in the long run, pointing to structural inefficiencies and weaknesses in fiscal management. Population growth consistently negatively affects human capital, especially over the long haul. Interestingly, unemployment presents a paradox, showing a positive correlation in the long run, which raises concerns about education expanding without job creation. GDP per capita seems to contribute minimally to human capital development over time but has a negative effect in the short term. This study concludes that although education reforms provide immediate benefits, their long-term effectiveness is compromised by systemic inefficiencies, demographic challenges, and a misalignment between educational systems and job markets. A comprehensive policy approach is recommended—one that integrates education with labor market demands, population management, and wider socio-economic strategies to promote sustainable human capital development in the region.

Keywords: Human capital development, Educational Reform, Sub-Saharan African Countries and panel non-linear ARDL
JEL Classification: I25, I28, O15, J24, H52, C33

INTRODUCTION

Human capital development is increasingly acknowledged as a key factor in driving economic growth, social advancement, and sustainable progress, especially in developing areas like Sub-Saharan Africa (SSA). At the heart of building human capital is education, which provides individuals with essential knowledge, skills, and competencies needed to engage productively in the workforce and contribute positively to society. Understanding the significance of education, governments throughout SSA have initiated a variety of reforms over the last twenty years to enhance access, equity, quality, and relevance in their education systems (UNESCO, 2022; World Bank, 2023).

These reforms have manifested in diverse ways, reflecting local priorities as well as global trends.

One major initiative embraced by several nations is the Universal Basic Education (UBE) program, which aims to offer free and mandatory basic education for all children. Countries like Nigeria, Ghana, and Uganda have implemented this program with the goal of increasing accessibility and narrowing educational gaps. In addition to UBE, many SSA countries have revamped their curricula, shifting from traditional, content-heavy approaches to more competency-based methods. For instance, Kenya rolled out its Competency-Based Curriculum (CBC) in 2017, while Rwanda enacted a similar reform in 2015. These changes are designed to promote critical thinking, creativity, and practical skills necessary for success in today's economy.

Furthermore, enhancements in teacher education and professional development have become crucial, as persistent shortages of qualified educators and low learning outcomes continue to challenge the region. Various countries are taking steps to strengthen teacher training, particularly in rural and underserved communities. In addition, reforms in Technical and Vocational Education and Training (TVET), particularly in Ghana, Nigeria, and South Africa, aim to tackle high youth unemployment and the disconnect between education and labor market needs.

The region has also embraced the integration of Information and Communication Technology (ICT) in education. For example, Rwanda's "One Laptop per Child" initiative and Ghana's digital learning platforms strive to improve digital literacy and broaden access to educational resources, especially in remote and under-resourced areas. Moreover, there are ongoing efforts to enhance inclusivity through gender-sensitive policies and language reforms, as seen in Malawi and Tanzania, which seek to bolster early-grade learning outcomes and promote equity.

Despite the ambitious reforms being undertaken, Sub-Saharan Africa (SSA) is still grappling with significant structural and systemic challenges. These challenges manifest in low enrollment rates in secondary and tertiary education, high dropout rates, poor infrastructure, and pronounced disparities between urban and rural education systems. While certain countries have made commendable strides in enhancing access to education and literacy, others are hindered by weak policy execution, insufficient funding, and a lack of institutional capacity. As a result, the tangible effects of these reforms on human capital development vary widely and are often poorly understood and under-evaluated (African Union, 2024; OECD, 2023).

Moreover, even though the intention behind education reforms is to improve learning outcomes and promote human capital growth, progress in broader economic indicators remains modest. Ongoing challenges like low labor productivity, high youth unemployment, and a disconnect between educational achievements and labor market needs highlight a pressing demand for systematic evaluation (World Economic Forum, 2023). This lays bare a crucial research question: How effectively have education reforms bolstered human capital development in Sub-Saharan Africa?

In tackling this question, the current study aims to thoroughly assess the impact of education reforms on human capital development within SSA. By scrutinizing both policy outcomes and structural obstacles, the study intends to offer evidence-based insights that can lead to more focused, context-aware, and sustainable reform strategies, ultimately fostering human capital growth and economic transformation across the region.

Human Capital Theory

This research focuses on Human Capital Theory as the foundational framework to explore how education reforms influence human capital development in Sub-Saharan Africa. Initially introduced by scholars like Theodore Schultz and later elaborated by Gary Becker, this theory posits that education is an investment that enhances individuals' skills, knowledge, and productivity, ultimately contributing to economic growth and societal advancement (Becker, 1993; Schultz, 1961). From this standpoint, education is viewed not just as a social right but also as a form of capital that yields returns in the form of improved employability, innovation, and labor efficiency (Psacharopoulos & Patrinos, 2018; Uzodigwe, Umeghalu, & Ozoh, 2019).

The basis of this study is the argument that sustainable development in Sub-Saharan Africa hinges on reinforcing education systems that do more than just expand access; it is crucial to enhance quality, equity, and relevance. Examples of policy interventions include competency-based curricula, teacher training and professionalization, the integration of information and communication technologies (ICTs), and an expanded focus on technical and vocational education and training (TVET), all designed to meet these goals. Despite the scale of these reforms, the region grapples with ongoing challenges such as high youth unemployment, poor learning outcomes, and a persistent misalignment between educational output and labor market needs (World Bank, 2023). These issues provoke critical questions about how effectively education reforms are fostering the development of productive human capital.

Applying Human Capital Theory serves as a powerful analytical tool for this investigation, emphasizing the significance of both the quantity (for example, enrollment rates and years of education) and quality (such as learning outcomes and employment relevance) of education in nurturing human capital. This study evaluates whether current reforms are confronting structural barriers—such as inequality, chronic underfunding, and weak institutional capacity—or merely focusing on increasing access without effecting meaningful change.

While critiques of Human Capital Theory often highlight its economic bias and the neglect of social, political, and institutional factors, its core assertion of education as a catalyst for productivity and development renders it particularly relevant to this study. Ultimately, the framework underscores the key premise of this research: the effectiveness of educational reforms

should not just be measured by increased enrollment or the adoption of policies, but rather by their demonstrable contributions to creating a skilled, employable, and innovative workforce in Sub-Saharan Africa (Nwogwugwu, & Umeghalu, 2021).

REVIEW OF RELATED LITERATURE

Recent empirical studies have investigated how education reforms relate to human capital development in various contexts across Sub-Saharan Africa (SSA). These studies reveal a mix of advancements and ongoing challenges in educational outcomes. For example, Asim et al. (2020) performed a comprehensive evaluation of teacher training reforms in Uganda. They found that while teaching practices showed improvement, the impact on student learning outcomes was limited. This highlights the necessity for additional investments in infrastructure and accountability measures.

In Ghana, Rolleston et al. (2019) examined the Free Senior High School (Free SHS) initiative. Their analysis illustrated that while enrollment numbers soared, the pressures on infrastructure and a reduction in instructional time threatened the long-term sustainability of the human capital benefits. This emphasizes the need to combine access-focused reforms with efforts to enhance educational quality.

In the case of Kenya, Musau and Migosi (2019) reported that the Competency-Based Curriculum (CBC) fosters practical skill acquisition among students. However, they noted that insufficient teacher readiness and inadequate resources hinder its effectiveness, highlighting the crucial role of systemic preparedness.

Ganaie and Bashir (2019) explored the relationship between public education expenditure, economic growth, and literacy rates in India using the Autoregressive Distributed Lag (ARDL) bounds testing approach. Their findings revealed a statistically significant positive long-term correlation between educational spending and literacy rates, indicating that sustained investment in education is vital for enhancing literacy outcomes over time. This highlights the pivotal role of financial commitment to the education sector in fostering human capital development in emerging economies like India.

Ogunleye and Adeyemi (2021) performed a panel data analysis focusing on ECOWAS countries to investigate how public education spending affects human capital development, especially concerning literacy. Their research indicated that enhanced government expenditure on education has a positive effect on literacy rates throughout the region. However, the extent of this impact varies from country to country due to factors such as institutional efficiency, the effectiveness of policy implementation, and different socio-economic conditions. This underscores the importance

of public investment in education for boosting literacy and emphasizes the necessity for robust policy frameworks to maximize the benefits from such investments.

In another study, Aina and Omoniyi (2021) assessed Nigeria's Universal Basic Education (UBE) program. They found that although there was an increase in enrollment and literacy rates, systemic challenges like overcrowded classrooms and ineffective teaching practices hampered improvements in learning outcomes. This indicates that for education reforms to fully achieve their objectives in enhancing human capital development, it is crucial to tackle entrenched institutional inefficiencies.

A regional comparative study by Oketch and Rolleston (2022) utilizing SACMEQ data indicated that countries like Rwanda and Mauritius, which have maintained consistent reform efforts, achieved better learning and skill outcomes compared to those with fragmented approaches. This underscores the importance of cohesive and comprehensive reform strategies.

Furthermore, UNESCO (2022), in its Global Education Monitoring Report: Africa Edition, pointed out that although ICT-in-education policies have been broadly implemented, unequal access to digital tools continues to exacerbate rural-urban disparities, limiting equitable human capital development.

Additionally, Tapsoba et al. (2023) assessed Technical and Vocational Education and Training (TVET) programs in Burkina Faso and Côte d'Ivoire. They found that reformed TVET systems that aligned closely with private sector demands resulted in higher employment rates and earnings for graduates, underscoring the importance of developing curricula that respond to labor market needs.

These empirical findings lend support to our study's premise. They reveal that while educational reforms have been broadly implemented, their effects on human capital development are not consistent and are often curtailed by insufficient implementation, limited resources, and fragmented policies.

RESEARCH METHODOLOGY

Model Specification

To assess the impact of education reforms on human capital development, we will utilize a quantitative analysis guided by ex post facto research, inspired by the empirical approach of Ogunleye and Adeyemi (2021), where literacy rates are modeled as a function of government education expenditure (GEE). However, this model diverges from previous methodologies by accounting for the potential feedback effects between educational reform and human capital development. The specified functional relationship between educational reform and human capital

development is outlined as follows:

$$LR = f(GEE, POP, UNR, GDPPC) \quad (1)$$

The general panel linear form of the model will be rewritten as:

$$LRit = \alpha + \beta_1 GEEit + \beta_2 POP\_it + \beta_3 UNR\_it + \beta_4 GDPPC\ it + \mu i + \lambda t + \varepsilon it \quad (2)$$

Where LR = literacy rate, GEE i= government expenditure on education, POP = population growth, UNR = unemployment rate, GDPPC = gross domestic product per capita, i = country, t = time, μ_i = country-specific effects and λ_t = time effects.

Estimation Technique and Justification

In this study, we utilize the Panel Autoregressive Distributed Lag (PARDL) model, which is well-suited for heterogeneous panels where the variables may be integrated at different orders, specifically I(0) and I(1), but not I(2). Here is why we have chosen the panel ARDL approach:

Mixed Order of Integration: Our preliminary unit root tests will help determine if the variables fall into the I(0) or I(1) categories, confirming the appropriateness of the panel ARDL model.

Capturing Dynamics: This model effectively estimates both short-run adjustment processes and long-run equilibrium relationships between Foreign Direct Investment (FDI) and inflation, providing a comprehensive view of the dynamics involved.

Accounting for Heterogeneity: Unlike the pooled OLS method, the panel ARDL approach (such as the Mean Group or Pooled Mean Group estimator) recognizes the structural and policy variances across Sub-Saharan African countries.

Addressing Endogeneity: By incorporating lagged variables and error correction terms, this model effectively controls for potential endogeneity issues that could arise from reverse causality between FDI and Consumer Price Index (CPI).

DATA PRESENTATION AND ANALYSIS

Descriptive Statistics

The empirical tests discussed were conducted using the E-view 9.0 software. A summary of the results is presented below.

Descriptive Statistics Test

Table 1 presents the descriptive statistics for a dataset comprised of 350 observations. The analysis indicates that the literacy rate averages at 101.38%, showing a slightly left-skewed and leptokurtic distribution, which may be attributed to variations in scale or reporting practices.

Table 1: Summary of Descriptive Statistics

	LR	GEE	POP	UNR	GDPPC
Mean	101.3810	3.844826	54.84483	7.247286	1984.242
Median	103.9110	3.173865	53.73389	4.142500	1181.890
Maximum	156.6143	12.46410	66.48385	30.80001	8097.645
Minimum	21.25427	0.173048	47.28657	0.320000	267.5285
Std. Dev.	23.45275	2.307639	4.426206	6.593114	2061.006
Skewness	-0.615272	1.194718	0.940400	1.481605	1.726763
Kurtosis	4.265184	4.700769	3.516377	4.322045	4.713563
Jarque-Bera	45.42605	125.4461	55.47574	153.5394	216.7541
Probability	0.000000	0.000000	0.000000	0.000000	0.000000
Observations	350	350	350	350	350

Author's Compilation Using E-view 9.0, 2025

Government spending on education stands at an average of 3.84% of GDP, displaying a positive skew, suggesting uneven distribution in expenditure among the observations. Population growth appears relatively stable, accompanied by minor skewness and moderate kurtosis. On the other hand, unemployment and GDP per capita demonstrate substantial variability, along with a high positive skew and peaked distributions, highlighting issues of income inequality and discrepancies in the labor market.

Table 2: Correlation Matrix

Covariance Analysis: Ordinary
Date: 05/23/25 Time: 04:10
Sample: 2000 2024
Included observations: 350

Correlation Probability	LR	GEE	POP	UNEMP	GDPPC
LR	1.000000				
GEE	0.194083	1.000000			
	0.0003	-----			
POP	0.157070	0.515665	1.000000		
	0.0032	0.0000	-----		
UNR	0.115066	0.525281	0.798630	1.000000	
	0.0314	0.0000	0.0000	-----	
GDPPC	-0.069923	0.436290	0.759089	0.828930	1.000000
	0.1919	0.0000	0.0000	0.0000	-----

Author's Compilation Using E-view 9.0, 2025

The significant range (maximum minus minimum) values and elevated standard deviation for both dependent and independent variables underscore the considerable disparity among Sub-Saharan African countries concerning these factors. Nevertheless, the Jacque-Bera test results, with p-values of 0.0000, confirm the normality of the data.

Additionally, the correlation matrix was analyzed, with the results summarized in Table 2. As illustrated in Table 2, the regressors do not exhibit perfect or strictly linear relationships with one another. The findings indicate that there is no linear dependency present between the dependent and independent variables, as none of the explanatory variables boasts of a correlation coefficient of 0.8 or higher. Hence, we can confidently conclude that multicollinearity does not pose a threat to the effectiveness of this model.

The Pesaran panel unit root test in the presence of cross-sectional dependence (CIPS and CADF) is presented in Table 3.

Table 3: Summary of Unit Root Test Results

Peasaran Panel Unit Root Test for Cross-sectional Data (CIPS & CADF)						
	CIPS			CADF		
	Level	1st Diff.	Decision	Level	1st Diff.	Decision
LR	-8.28	-6.69	I(0)	-4.53	-4.09	I(0)
GEE	-4.64	-2.39	I(0)	-2.82	-4.16	I(0)
POP	-3.34	-2.30	I(0)	-2.53	-3.63	I(0)
UNR	-4.86	-8.17	I(0)	-3,98	-5.09	I(0)
GDPPC	-1.47	-12.02	I(1)	-2.11	-5.06	I(1)

Source: Researchers' Compilation using Stata 15, 2025

Moving on to Table 3 where the conducted Pesaran panel unit root test is presented. The results from our panel unit root analysis using CIPS and CADF reveal that all CIPS and CADF statistics exceed their critical thresholds at the 10%, 5%, and 1% levels of significance, both at level and first difference. This indicates that the variables are integrated of order one [I(0)], while GDPPC exhibits stationarity only at the first difference, classified as order [I(1)]. Consequently, we will proceed with the panel co-integration analysis.

Table 4 further presents co-integration test results consisting of seven metrics: panel v-statistic, panel rho-statistic, panel PP-statistic, panel ADF-statistic, group rho-statistic, group PP-statistic, and group ADF-statistic, each accompanied by their respective probability values. The null hypothesis posits that there is no cointegration among the variables. However, the p-values for five of these outcomes are not statistically significant. In other words, there is no evidence of a long-run relationship present.

Over the long term, our analysis reveals a significantly negative coefficient for government education expenditure, measuring at -7.96, with a t-statistic of -8.92 and a p-value of 0.00 as shown in Table 5.

Table 4: Panel Cointegration Test Result

Series: LR GEE POP UNR GDPPC
Date: 05/23/25 Time: 04:13
Sample: 2000 2024
Included observations: 350
Cross-sections included: 14
Null Hypothesis: No cointegration
Trend assumption: No deterministic trend
User-specified lag length: 1
Newey-West automatic bandwidth selection and Bartlett kernel

Alternative hypothesis: common AR coefs. (within-dimension)

	Statistic	Prob.	Weighted Statistic	Prob.
Panel v-Statistic	0.303011	0.3809	-1.034639	0.8496
Panel rho-Statistic	1.458278	0.9276	1.370420	0.9147
Panel PP-Statistic	-2.505094	0.0061	-1.569073	0.0583
Panel ADF-Statistic	-3.827808	0.0001	-2.013223	0.0220

Alternative hypothesis: individual AR coefs. (between-dimension)

	Statistic	Prob.
Group rho-Statistic	3.050314	0.9989
Group PP-Statistic	-0.262641	0.3964
Group ADF-Statistic	-1.003788	0.1577

All test statistics are distributed N(0,1), under a null of no cointegration, and diverge to negative infinity (save for panel v).

Source: Researchers' compilation using E-views 9.0, 2025

This finding suggests an unexpected outcome where increased government spending on education correlates with a decline in human capital development. Additionally, the coefficient for population growth is also negative at -1.15, with a t-statistic of -3.11 and a p-value of 0.002, indicating that higher population growth rates may impede long-term human capital development.

On a more positive note, the unemployment rate presents a different picture, showing a coefficient of 2.82, coupled with a robust t-statistic of 10.06 and a p-value of 0.00. This points to a strong and statistically significant positive relationship between unemployment and human capital development over time. The coefficient for GDP per capita is positive at 0.002, with a marginally significant t-statistic of 1.97 and a p-value of 0.05.

In contrast, the short-term results display a positive and statistically significant coefficient for Government Expenditure on Education at 6.23. This is supported by an impressive t-statistic of 20.66 and a p-value of 0.00, suggesting that government investment in education fosters human capital growth in the short run.

Table 5: Summary of Result for Panel ARDL Test

Variables	(LR)		
Longrun	**Coeff.**	**t-Stat.**	**Prob**
Gee	-7.96	-8.92	0.00
Pop	-1.15	-3.11	0.00
UNR	2.82	10.06	0.00
Pgppc	0.02	1.97	0.05
Short run			
ECT(-1)	-0.84	-24.90	0.00
Gee	6.23	20.66	0.00
Pop	-0.32	-1.43	0.15
UNR	-0.26	-1.26	0.21
Pgppc	-0.005	-7.38	0.00

Source: Researcher compilation using E-view 9.0, 2025

However, the coefficient for population growth remains negative at -0.32, though it lacks statistical significance (t-statistic = -1.43; p-value = 0.15), indicating minimal immediate impact on human capital. Similarly, the unemployment rate shows a negative coefficient of -0.26, which is also insignificant (t-statistic = -1.26; p-value = 0.21), suggesting that short-term unemployment does not substantially affect human capital development. Furthermore, the GDP per capita coefficient reflects a negative value of -0.005, accompanied by a significant t-statistic of -7.38 and a p-value of 0.00, implying that rising income levels may inadvertently lead to lower investments in human capital in the short term.

Lastly, the error correction term (ECT) stands at -1 and is significant, reinforcing that the sign is appropriate. This indicates that any short-run disequilibrium is corrected at a pace of 0.84 percent, moving towards long-run equilibrium.

Discussion of Findings

The exploration of the panel ARDL model yields intricate and varied relationships between key explanatory variables and the development of human capital in Sub-Saharan African (SSA) countries. These insights highlight the complex nature of education reforms situated within broader macroeconomic and demographic frameworks.

Our study demonstrates a positive and statistically significant impact of government spending on education in the short term. This suggests that investments in education and reforms can lead to immediate benefits for human capital development. This aligns with prior research, including

works by Asim et al. (2020) and Bold et al. (2018), which show that focused initiatives—such as enhancing teacher training, supplying educational materials, and upgrading school facilities—can produce tangible short-term gains.

Conversely, the analysis reveals a negative long-term coefficient, indicating that, over time, increased financial input does not necessarily yield sustainable growth in human capital. This unexpected outcome hints at structural inefficiencies, such as weak fiscal management, corruption, insufficient oversight, and a disconnect between the educational output and labor market demands. This observation resonates with critiques from Pritchett (2013), who notes that while access to schooling has surged, actual learning outcomes remain dishearteningly low in many SSA nations, highlighting a persistent learning crisis.

Moreover, the study consistently identifies a negative correlation between population growth and human capital development, evident in both the short and long term, though statistically significant only in the latter. This finding aligns with intuitive reasoning, as rapid population increases exert significant pressure on already under-resourced educational frameworks—overcrowded classrooms, teacher shortages, and limited public investment, contributing to a decline in educational quality. As highlighted by UNESCO (2022), numerous SSA countries face challenges in meeting the demand for quality education amidst high fertility rates, leading to reduced per capita investment in students.

A particularly intriguing and somewhat paradoxical result is the positive long-term relationship between unemployment and human capital development, which holds statistical significance. This phenomenon may be indicative of structural unemployment, where rises in educational attainment do not match job availability, signifying a mismatch between skills and labor market needs. This finding raises important questions regarding the relevance of educational content and the efficacy of reforms in tying education to real-world economic conditions. Interestingly, the short-term effect appears negative, though not statistically significant, suggesting that immediate responses to unemployment rates have limited impact on education-related results.

These findings resonate with observations made by Oketch (2021), who highlighted that while expanding educational access is crucial, without accompanying labor market reforms or support for entrepreneurship, SSA economies may end up with a surplus of educated individuals lacking employment opportunities.

The positive yet somewhat limited long-term impact of GDP per capita on human capital development indicates that economic growth plays a role in enhancing educational outcomes over time. This might occur through increased investment in essential public services like education and healthcare, which aligns with human capital theory (Becker, 1993). This theory suggests that

when an economy thrives, it bolsters the growth and effective use of human potential.

On the other hand, the short-term dynamics present a negative and significant trend. This suggests that immediate economic improvements might not translate into benefits for the education sector. Instead, they could lead to a greater focus on consumption and infrastructure projects rather than on human development. This contrast might point to fiscal trade-offs and the delayed effects of economic growth on education results.

Implications of the Findings

These observations underline the necessity for strategic reforms that extend beyond just increasing funding. Effective education reform in Sub-Saharan Africa should:

- Focus on the efficient allocation and use of resources.
- Enhance the quality of education, not just the accessibility.
- Encourage policies around demographic management, including family planning and youth-oriented initiatives.
- Adjust curricula to be more relevant and in tune with labor market demands, thereby addressing the gap between education and employment.
- Pair educational reforms with comprehensive economic and governance reforms to bolster long-term success.

Conclusion and Policy Recommendation

The study paints a mixed picture regarding the effects of educational reforms on human capital development in Sub-Saharan Africa. Although short-term strategies show potential, their long-term effectiveness is jeopardized by inefficiencies, demographic challenges, and economic disparities. Policymakers should embrace a comprehensive, long-term view that weaves together education, health, population management, labor market needs, and public finance. This approach would involve coordinated planning across sectors, such as linking educational programs with health and nutrition initiatives, tailoring curricula to meet job market needs, managing population growth through reproductive health education, and ensuring sustainable funding through budgetary reforms. By positioning education as part of a broader development framework and relying on data-driven insights, policymakers can facilitate long-lasting, inclusive, and sustainable advancements in human capital development throughout the region.

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