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EMPOWERING SOCIO - ECONOMIC DEVELOPMENT BY ADDRESSING POVERTY CHALLENGES IN SABAH'S DEVELOPING DISTRICTS

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Abstract: *Poverty remains one of the main barriers to socio-economic development in many of the less-developed districts of Sabah, and a better understanding of the driving forces is urgently required. This paper analyses the relationship between poverty, population dynamics, and the levels of extreme poverty using data analytics in Sabah districts. This study analyses the datasets' demographic profiles, economic indicators, and patterns, applying correlation techniques, linear regression, and demographic analysis. The results of such analysis will provide critical information on the crucial socio-economic driving factors of poverty levels at the sub-national scale, and it pinpoints areas where interventions can be optimised for maximum impact. By analysing it, we may find the correlation between poverty levels and population density, economic activity, and access to resources. Such insights are essential in targeted interventions and efficient resource allocation, especially for economically distressed communities. The findings of this study can be used to guide policy formulation and resource allocation, leading to more effective interventions and, ultimately, sustainable and equitable prosperity in the districts of Sabah. The paper contributes to a more strategic and informed approach towards alleviating poverty in the region.*

Keywords: *Socio-economic growth, data analytics, poverty, unemployment, Sabah*

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Introduction

There are extensive socio-economic problems throughout all developing regions of the world, including but not limited to poverty and unemployment, two major concerns. Innovative solutions are necessary for sustainable development across locations such as Sabah, Malaysia. Indeed, due to the increasing population and their needs with restricted resources, these challenges are multiplied, as narrated by the United Nations Development Programme (2019) and Mohd Huda et al. (2022). Nonetheless, the present study has explored new possibilities of data analytics in tackling these issues within the districts of Sabah.

For example, understanding the relationship between demographic and economic variables and resource use would provide the root causes of poverty and unemployment. These, in turn, carry critical messages to governments and organisations when devising appropriate interventions and attracting suitable investments into resources that improve well-being within the communities and ensure economic growth. It also encourages evidence-based decision-making by stakeholders through the ability to determine the effectiveness with ongoing initiatives to revise their strategies where needed (Cozzoli et al., 2022; Sarker, 2021). It enhances adaptive governance in delivering more responsive and efficient socio-economic project developments, mainly when things keep changing around variables. Iterative efforts lead to increased effectiveness and even sustainable longer-term impacts on addressing socio-economic issues.

Moreover, the districts in Sabah present a unique opportunity to understand how various data-driven approaches enhance socio-economic conditions. Sabah's cultural diversity and socio-economic landscapes offer a rich dataset with important lessons for understanding regional development dynamics (Peng et al., 2022; Mohd Huda et al., 2022). The study outlines how such applications in Sabah may shed light on socio-economic prospects for a more inclusive and prosperous future in the developing region. It also further points out evidence-based decision-making and policy formulation led by data. The two hypotheses introduced in this study are H1: There is a significant relationship between district population density and poverty or impoverishment rates, and H2: There is a significant relationship between extreme impoverishment rates and district population density.

The paper is organised as follows: Section 2 discusses the background and related works concerning poverty and unemployment in Sabah, data analytics, and research gaps in this study. Section 3 elaborates on the framework and methodology for data analysis and visualisations. Section 4 presents findings and analyses of economic issues and efforts on socio-economic growth. Finally, Section 5 summarises the research through a conclusion.

Literature Review

This section covers literature and contributes towards the expanding domain of data-driven development in developing areas within Sabah.

Poverty, Unemployment, and Development in Developing Districts in Sabah

Poverty and unemployment are still deeply entrenched in many of the world's developing regions, notes the World Bank (2020). This pose, indeed, two of the two most serious obstacles or barriers to economic development, social cohesion, and human welfare. According to the United Nations Development Programme in 2019, such deeply alarming problems in infrastructure deficiencies, insufficient education and health services, and inequities in income

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distribution feed into the noxious self-perpetuating cycle of poverty and unemployment in these developing regions. These challenges are multidimensional, and scholars have articulated them in a befittingly underpinning emphasis on comprehensive approaches, factoring in the background socio-economic dynamics (Md Shah et. al., 2023). Certainly, previous studies have already shed substantial light on the interrelatedly interactive relationship between poverty and unemployment and other socio-economic aspects like education, health, gender disparity, and accessibility to financial services (Wu et al., 2024). However, the World Bank (2019) has told us that solutions to interrelated problems should be implemented in a way that emphasises inclusive development and gives power to the marginalised population.

The complexity of the variables that cause poverty has also been in the limelight of several studies on poverty within Sabah. Indeed, the efforts to reduce poverty in Sabah are relatively complicated (Dambul et al., 2010). Undeniably, with its rugged terrain, many areas of isolation, and dependence of its economy on very vulnerable sectors such as agriculture and tourism, the Sabah state does stand out as a challenge regarding how much the country can reduce poverty effectively (Wahab et al., 2018). Lim and Mansur (2016) also established that indigenous communities face socio-economic disadvantages further complicated by land rights disputes. Livelihoods worsened because of environmental degradation, brought about by inadequate and limited access to education, health, and infrastructure (Encharang et al., 2022). This would entail inclusive governance, investment in education and health, sustainable management of resources, and efforts toward fighting corruption (Orlando & Suffian, 2020).

Recently, various approaches have been used to understand the complexity of poverty in Sabah to enact appropriate interventions (Tey et al., 2022; Mohd Huda et al., 2022). These approaches range from socio-economic surveys, which map poverty levels and identify vulnerable populations, to qualitative research into the lived experiences and community perspectives, including the following: participatory action research, in which communities take an active lead in finding solutions to problems; policy analysis to look at existing initiatives critically; multidisciplinary approaches, since there is a variety of factors that drive poverty; geospatial analysis for identifying hotspots of poverty or environmental degradation; prospective studies to monitor changes over time; and cross-cultural investigations to understand the diverse experience and coping processes. Combinations of these methods are, therefore, being used in the development of evidence-based strategies for poverty alleviation rooted in its root causes and linked to sustainable development. Data analytics regarding issues of poverty in Sabah remains very low.

Utilisation of Data Analytics in Addressing Socio-Economic Issues

Data analytics applied to socio-economic problems, such as poverty and unemployment, have grown over the last few years. Statistical analysis, data mining, and predictive modelling will be used. Manyika et al. (2011) suggested that data analytics provides effective tools to extract valuable information from large datasets so that all stakeholders may make relevant decisions in allocating resources. This would further enhance economic and workforce development by understanding labour market shortages and informing skills matching with job opportunities (Turulja et al., 2022). Equally, data analytics help in the efforts to reduce poverty by equipping people with ways to improve their subsistence. This leads to constructing socio-economic policies using sources such as employment surveys and administrative data by determining vulnerabilities and constructing targeted interventions (Vankevich and Kalinouskaya, 2021).

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Likewise, Nohuddin et al. (2022) propose a data analytics framework to track academic performance and life patterns of B40 communities in Malaysia by using the assembled insights for targeted interventions toward educational improvement. The same algorithms can be used to predict unemployment patterns to design responsive employment policies. This would minimise labour market inefficiencies and mismatches because the jobs are matched with the right kind of skills (Afzal et al. (2012); Thulasy et al. (2021). A few studies indicate that data analytics form a firm basis for interpreting the efforts at poverty alleviation, improving welfare program efficiency, and resource allocation. Thus, this study aims to show how data analytics can deal with problems such as misreporting and help in designing evidence-based policies to combat extreme poverty and unemployment. Although reliable data is essential in successful policymaking, the availability and quality remain thorns in the flesh of development economics (Forsbacka Karlsson et al., 2019; Easterly, 2009).

Methodology

This section covers literature and contributes towards the expanding domain of data-driven development in developing areas within Sabah.

Data Collection

The data collection in this study was based on access to government databases, particularly through the eKasih database maintained by Unit Penyelarasan Pelaksanaan, Prime Minister's Department. The eKasih database is the source for comprehensive data on households identified as poverty and hardcore poverty in the districts of Sabah. Meanwhile, eKasih should be underlined as a National Poverty Data Bank, which has been equipped with various information on poverty, starting from individual profiling up to the type of assistance or programs given by any aid agencies to Heads of Households-Ketua Isi Rumah (KIR)-and Households Members-Ahli Isi Rumah (AIR). Furthermore, eKasih is a portal to apply for aid and assistance and check eligibility for aid applications. Lastly, eKasih effectively manages and monitors the government's poverty alleviation programs. Table 1 shows the overview of the total number of poverty (Miskin) and extreme poverty (Miskin Tegar) households in the 27 districts of Sabah.

Generally, the poverty groups are those earning below-average incomes. The very poor, however, refers to a person who earns below the Poverty Line Income (PLI) of RM 2,208.00 per household monthly, which is RM 1,169 for food and RM 1038 for non-food items. This is done when the overall PLI is prorated with the total number of households in Malaysia, arriving at an average PLI of RM2,208. DOSM conducts the Household Income Survey once every five years to provide base data for calculating PLI. It was conducted in all private households in the living quarters through personal interviews and web-based self-response.

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Table 1: Total Number of Poverty (Miskin) and Extreme Poverty (Miskin Tegar) by District in Sabah, as of 31 May 2023

District	Population	Poverty	Extreme Poverty	Total	District	Population	Poverty	Extreme Poverty	Total
Beaufort	77100	2111	793	2904	Penampang	165700	635	254	889
Beluran	83800	1710	1114	2824	Pitas	37900	2725	1761	4486
Kalabakan	53200	379	70	449	Putatan	70200	396	95	491
Keningau	156000	2445	1478	3923	Ranau	87500	2101	1345	3446
Kinabatangan	149000	1258	487	1745	Sandakan	469700	2622	1361	3983
Kota Belud	109500	3194	1322	4516	Semporna	186000	2490	1543	4033
Kota Kinabalu	525300	2408	811	3219	Sipitang	39300	767	221	988
Kota Marudu	72300	2972	1309	4281	Tambunan	32700	1027	349	1376
Kuala Penyu	24200	790	368	1158	Tawau	393800	2900	995	3895
Kudat	90600	2727	1735	4462	Telupid	30300	501	268	769
Kunak	76100	759	324	1083	Tenom	52900	1772	1118	2890
Lahad Datu	241200	1569	935	2504	Tongod	43900	1332	661	1993
Nabawan	30100	1955	776	2731	Tuaran	139900	2839	1091	3930
Papar	154600	1893	676	2569					

Source: (*eKasih*, Unit Penyelarasan Pelaksanaan, 2023)

Data Analytics Framework

The trends in the socio-economic status currently in the districts of Sabah reveal huge disparities in poverty and unemployment rates in the region. Data analytics and visualisation tools provide an opportunity to zoom in on data trends and patterns, which, in turn, can highlight any area of concern, thus leading effectively to intervention. The framework for data analytics, as given in Figure 1, includes three main modules: Data Collection, Analytics Engine, and Findings Analysis and Proposal. It was previously mentioned that districts, population statistics, headcounts of poor, and counts of ultra-poor are key features identified in the Data Collection module. The Analytics Engine shall do three fundamental processes: data pre-processing, analytics engine, and visualisation of patterns and trends. Finally, the framework contains the Findings Analysis and Proposal module, where insight is expected for the programs and policy development to bring mass awareness.

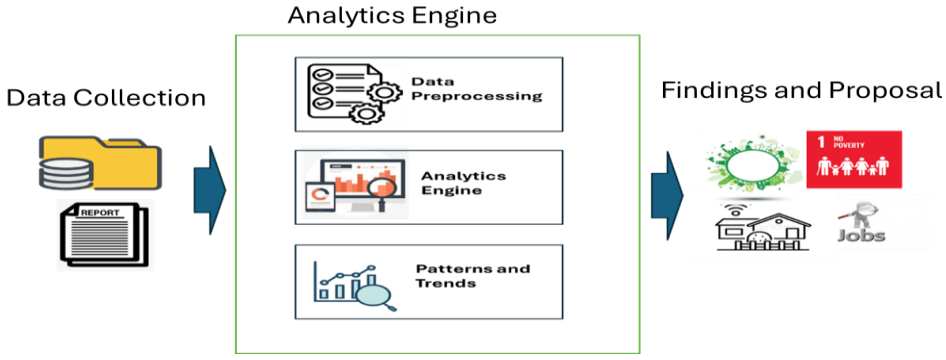

Figure 1: Data Analytics Framework

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By employing a complete framework for data analytics, stakeholders could utilise insights derived from the data to facilitate inclusive growth and promote sustainable development within the region.

Results and Findings

The study revealed significant demographic factors affecting the observed data. Detailed linear regression analysis revealed complex variable relationships. These findings support our initial hypotheses and suggest ways to study the mechanisms behind such correlations.

Demographics

Figure 2 depicts district demographics versus population. Kota Kinabalu has the highest population, with 525,300 residents. Conversely, Kuala Penyu has the lowest population, with only 24,200 inhabitants. The region exhibits significant socio-economic diversity, as evidenced by the average population of approximately 150,438 across all districts.

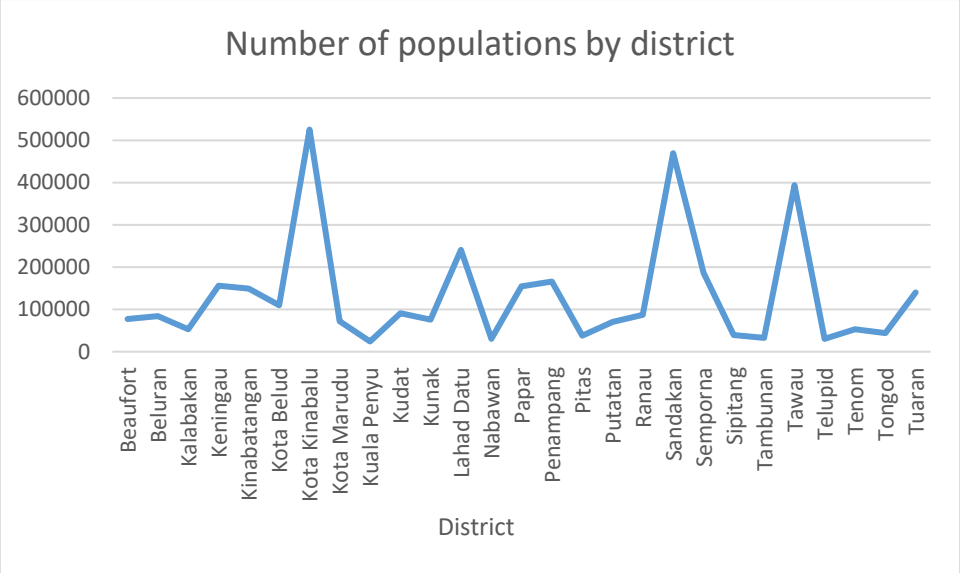

Figure 2: Number of Populations by District

Furthermore, Figure 3 illustrates the distribution and comparative analysis of poverty and extreme poverty rates across various districts in Sabah. It exposes the possibility of different levels of socio-economic difficulties throughout the region. Kota Belud shows a greater aggregate poverty count of 3,194 individuals compared to Kalabakan, which is 379. Furthermore, the extreme poverty rate of 1,322 in Kota Belud surpasses that of Kalabakan, which stands at 70. These comparisons underscore differences in economic circumstances and areas that may necessitate focused intervention and assistance.

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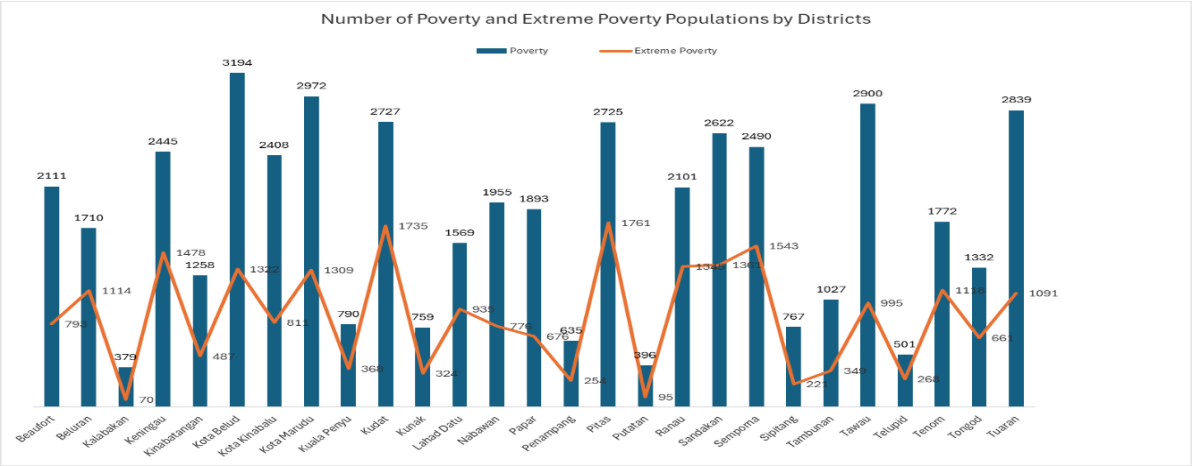

Figure 3: Number of Poverty and Extreme Poverty by Districts

Expanding the study, we propose two hypotheses to investigate the relationships between population density, poverty, and extreme poverty:

H1: There is a significant relationship between the poverty rate and the density of the district population.

This hypothesis suggests that as population density increases, so does the poverty rate—Tables 2 and 3 present an analysis that deepens the understanding of socio-economic dynamics within the region. We conducted a linear regression analysis to explore the relationship between the poverty rate (dependent variable) and the density of the district population (independent variable). The coefficient revealed that there is a significant relationship between them. The model achieved an R-squared value of 0.162, indicating that the independent variables included in the model can explain approximately 16.2% of the variance in poverty rates. The p-value < 0.001 in the coefficient shows a positive significant relationship between the poverty rate and the density of populations.

Table 2: Coefficient Analysis – Poverty

Model	R	R^2	Adjusted R^2	RMSE
H_0	0.000	0.000	0.000	895.575
H_1	0.403	0.162	0.129	836.018

Table 3: ANOVA Analysis - Poverty

Model		Sum of Squares	df	Mean Square	F	p
H_1	Regression	$3.380\times10^{+6}$	1	$3.380\times10^{+6}$	4.836	0.037
	Residual	$1.747\times10^{+7}$	25	698925.942		
	Total	$2.085\times10^{+7}$	26			
Model		**Unstandardized**	**Standard Error**	**Standardized**	**t**	**p**
H_0	(Intercept)	1788.037	172.353		10.374	< .001
H_1	(Intercept)	1425.176	230.458		6.184	< .001
	Population	0.003	0.001	0.403	2.199	0.037

Note. The intercept model is omitted, as no meaningful information can be shown.

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H2: There is a significant relationship between the extreme poverty rate and the density of the district population.

For H2, we conducted a linear regression analysis to explore the relationship between the extreme poverty rate (dependent variables) and the density of the district population (independent variable) in Tables 4 and 5. The coefficient revealed that there is a significant relationship between them. The model achieved an R-squared value of 0.05, indicating that the independent variables included in the model can explain approximately 5% of the variance in poverty rates. The p-value < 0.001 in the coefficient shows a significant positive relationship between the poverty rate and the density of populations. The following section generally discusses various contributing factors to poverty rates and population density.

Table 4: Coefficient Analysis – Extreme Poverty

Model	R	R^2	Adjusted R^2	RMSE
H_0	0.000	0.000	0.000	514.696
H_1	0.224	0.050	0.012	511.571

Table 5: ANOVA Analysis – Extreme Poverty

Model		Sum of Squares	df	Mean Square	F	p
H_1	Regression	345081.261	1	345081.261	1.319	0.262
	Residual	$6.543\times10^{+6}$	25	261704.779		
	Total	$6.888\times10^{+6}$	26			
Model		**Unstandardised**	**Standard Error**	**Standardised**	**t**	**p**
H_0	(Intercept)	861.481	99.053		8.697	< .001
H_1	(Intercept)	745.544	141.020		5.287	< .001
	Population	8.713×10^{-4}	7.588×10^{-4}	0.224	1.148	0.262

Note. The intercept model is omitted, as no meaningful information can be shown.

Table 6: Correlations analysis between population, poverty and extreme poverty

Pearson's Correlations		Population	Poverty	Extreme Poverty
Variable				
Population	Pearson's r	—		
	p-value	—		
Poverty	Pearson's r	0.403	—	
	p-value	0.037	—	
Extreme Poverty	Pearson's r	0.224	0.883	—
	p-value	0.262	< .001	—

The correlation analysis in Table 6 reveals insightful positive relationships between population, poverty, and extreme poverty. The data indicates a moderate positive correlation (Pearson's r = 0.403, p = 0.037) between population and poverty, suggesting that as population increases, so does the incidence of poverty.

However, the correlation between the population and the extreme poverty group is weak and statistically non-significant (Pearson's r = 0.224, p = 0.262). Conversely, a strong positive

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correlation (Pearson's r = 0.883, p < 0.001) is observed between poverty and extreme poverty, indicating that areas with higher poverty rates tend to exhibit higher extreme poverty rates. These findings underscore the intricate dynamics between socio-economic factors, with poverty appearing as a significant determinant of extreme poverty, while the relationship between population and extreme poverty remains inconclusive.

Discussions

The data analysis revealed many important conclusions on the prevalence of poverty, which could result from unemployment issues in the districts of Sabah. Firstly, there is extensive variation in poverty and unemployment rates; some districts show higher deprivations compared to others. The rural poor, for example, are concentrated in Kota Belud and Kudat, while higher unemployment rates are found in Lahad Datu and Semporna. The results also indicated strong correlations among variables relating to socio-economic indicators with poverty and unemployment rates. Factors such as educational facilities, health facilities, and infrastructural developments were found to have significantly impacted poverty and unemployment rates across the region, as expected. This is because localities with better access to these resources would have lower poverty and unemployment rates.

These findings are highly relevant to how poverty and unemployment alleviation can be facilitated within the districts of Sabah. For poverty mitigation and job creation, policymakers and other stakeholders must ensure adequate budgeting for education, health care, and infrastructure development. Besides, focused interventions should be designed in line with district-specific needs for effectiveness in equal development. Prior research and theoretical frameworks emphasise the need to address these basic socio-economic causes as the pathway towards alleviating poverty and unemployment. The findings of this study, in line with previous literature, illustrate that education, health, and infrastructure are interdependent and together affect the rates of poverty and unemployment (Wahab et al., 2018; Mohd Huda et al., 2022). The following policy solutions can be put up with respect to empirical evidence in order to tackle problems related to poverty and unemployment effectively in the districts of Sabah:

1. Enhance access to education and training under the vocational training program to equip people with necessary working skills for gainful employment.
2. Step up healthcare infrastructure and services to enhance overall well-being and productivity, thereby reducing poverty.
3. Invest in creating infrastructure—transport and utilities—to bolster economic growth through spending and creating jobs in less privileged areas.
4. Unusually high numbers of social welfare programs can be implemented to help the weak and the poor alleviate the sufferings of poverty and unemployment.

Data analytics will significantly support the formulation of policy interventions by extracting meaningful insights embedded in the socio-economic patterns, indicating areas that need to be given more focus, and further assessing their efficiency. For the first time, through data analytics, policymakers would have been equipped with the ability to make evidence-based decisions and allocate resources efficiently, thereby maximizing the impact of the said programs on socio-economic development in the districts of Sabah.

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By taking these suggestions, holistic economic growth will be activated, and long-term development for the districts of Sabah will be guaranteed. Stakeholders will, therefore, be working toward establishing strong and prosperous communities within the region by dealing with the root causes of poverty and unemployment and thus creating conditions that call for holistic development

Conclusion

The present research has pointed out the high level of poverty and unemployment in the districts of Sabah while bringing out how data analytics could help address these socio-economic challenges. The analysis has also made it clear that there is a mismatch between various districts with respect to different indicators, and hence, targeted intervention relevant to the needs of the specific community is needed. Most of the socio-economic variables relate to high rates of poverty and unemployment, underlining the primacy of root causes for ensuring sustained advancement in education, healthcare, and infrastructural development. The findings have broader implications for Sabah and other developing regions because this requires the policymakers to trigger impartial growth and extract data analytics for evidence-based decision-making. Further, this was integrated with data analytics, which proved very instrumental in optimising resource allocation and enhancing the reach of the initiatives on poverty and unemployment. Future unemployment data will improve the socio-economic analysis of the region of Sabah, adding depth to the understanding of the relationship between poverty, unemployment, and population density. This mixed-data approach will also inform future research into the determinants of economic well-being and support the development of more effective policy interventions. Therefore, this calls for further research on the long-term impacts of data-driven interventions and ethical considerations when using data analytics for development. It will go a long way toward delving into some of the advanced methodologies, like spatial analysis and predictive modelling, for deeper insights into the dynamics of poverty and unemployment in emerging regions.

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