**Asia Pasific Journal of Management and Education (APJME)**
**Vol.6 No.1, pp.108-120, March 2023**
**E-ISSN: 2655-2035 P-ISSN: 2685-8835**
**https://www.ejournal.aibpmjournals.com/index.php/APJME**

# Impact of Economic Growth on Human Capital, Work Participation, and Emission Reductions: Case Study in Indonesia

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**ARTICLE INFORMATION**

**Publication information**

**Research article**

**HOW TO CITE**
Murniati., Sulisnaningrum, E., & Priyanto, E. (2023). Impact of Economic Growth on Human Capital, Work Participation, and Emission Reductions: Case Study in Indonesia. *Asia Pasific Journal of Management and Education*, *6*(1), 108-120.

**DOI: https://doi.org/10.32535/apjme.v6i1.1647**



Received: 4 July 2022
Accepted: 16 February 2023
Published: 20 March 2023

**ABSTRACT**

Investments are influenced by the level of education and work participation in Indonesia; this happens the same with Human Capital. The importance of human capital and investment can have an impact on economic growth and emission reductions. Based on the results of previous studies, the demand for studies on economic growth, human capital, labor participation, and emission reductions is increasing. To determine the causal link between variables, this study used "autoregressive vectors" modeling across 21 years from 2000 to 2020. World Bank's data with the Kementerian Lingkungan Hidup dan Kehutanan are the foundation of this study (KLHK). We take into account Indonesia's economic development, labor force participation, investment, level of education, and emission reductions. Based on some conclusions from this research, we found that increased economic growth will also result in higher labor participation rates. Still, it will also result in a drop in Indonesia's investment climate, which will raise emissions while simultaneously encouraging higher levels of education. As investment declines, labor participation will rise as well. Future research should attempt to associate total investment with the level of labor participation in Indonesia because this study has a flaw in that it only considers "foreign investment", and not the whole amount of investment.

**Keywords:** Economic Growth, Emission Reduction, Human Capital, Labor Participation

## INTRODUCTION

In order to foster economic development, it is crucial to augment personal economic growth by investing in education and training, which leads to a surge in the overall lifetime income earned as a result of these investments. This underscores the notion that education and training are not merely a conduit to acquire knowledge and expertise but rather an investment that enriches an individual's potential to make a valuable contribution to the economy (Lentini & Gimenez, 2019). An individual's investment in education or training can result in private economic gains, which can be quantified by calculating the net surge in lifetime income earned. This return on investment is viewed as a profit for the individual. The correlation between school enrollment and employment levels is significantly impacted by the rate of labor force participation. By investing in human capital, notably through higher education, individuals are anticipated to enhance their skills dynamically, thereby contributing to long-term growth positively (Adejumo, Asongu, & Adejumo, 2021). Harnani, Rusminingsih, and Damayanti (2022) state that human capital loss is incredibly reliant on the education gained. Therefore, rate of labor force participation pertains to the proportion of the working-age population who are currently engaged in labor force activities. The labor force encompasses both individuals who are currently employed and those who are actively seeking employment but have yet to secure a job. The working-age population is generally classified as individuals aged between 16 and 64 years old (Pratomo, 2017). A study by Nizar, Hamzah, and Syahnur (2013) found that Economic Growth, Labor and Investment, Government investment, and Labor have a negative impact on the economy's growth.

**Figure 1.** Graphic data Economic Groth, Labor Participation, Education and Investment Indonesia in 2000-2021

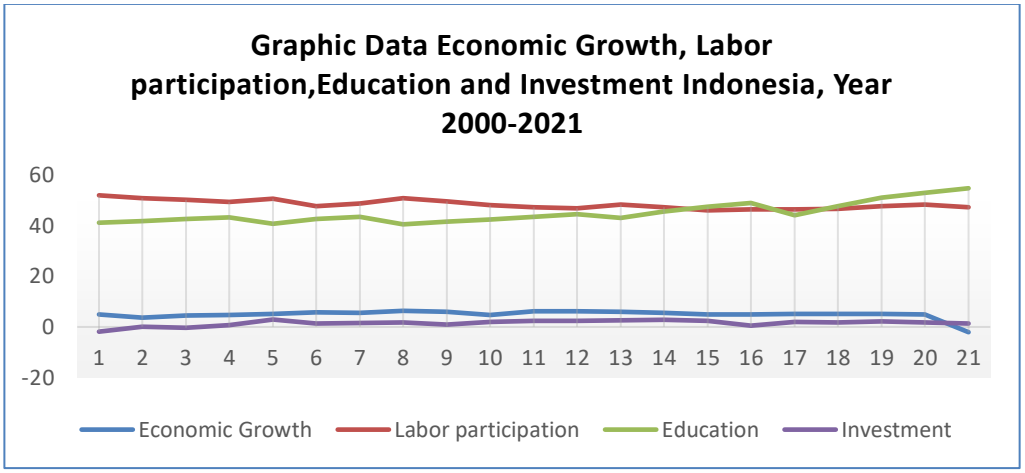



**Table 1.** Data Economic Groth, Labor Participation, Education and Investment Indonesia in 2000-2021

| Years | Economic Growth | Labor participation | Education | Investment |
|---|---|---|---|---|
| 2000 | 4,920068 | 51,8 | 40,95703 | -1,85569 |
| 2001 | 3,643466 | 50,67 | 41,66913 | 0,074152 |
| 2002 | 4,499475 | 50,05 | 42,49916 | -0,25426 |
| 2003 | 4,780369 | 49,28 | 43,13076 | 0,738244 |
| 2004 | 5,030874 | 50,41 | 40,65249 | 2,916115 |
| 2005 | 5,692571 | 47,61 | 42,58705 | 1,347943 |

| | | | | |
|---|---|---|---|---|
| 2006 | 5,500952 | 48,61 | 43,27655 | 1,603011 |
| 2007 | 6,345022 | 50,57 | 40,37876 | 1,826329 |
| 2008 | 6,013704 | 49,37 | 41,39834 | 0,903919 |
| 2009 | 4,628871 | 48,05 | 42,29054 | 2,025179 |
| 2010 | 6,223854 | 47,13 | 43,38629 | 2,302984 |
| 2011 | 6,169784 | 46,77 | 44,48204 | 2,30978 |
| 2012 | 6,030051 | 48,07 | 42,87391 | 2,551356 |
| 2013 | 5,557264 | 47,06 | 45,38903 | 2,819973 |
| 2014 | 5,006668 | 45,88 | 47,29392 | 2,297616 |
| 2015 | 4,876322 | 46,3 | 48,80207 | 0,487372 |
| 2016 | 5,033069 | 46,26 | 43,97231 | 2,019489 |
| 2017 | 5,069786 | 46,44 | 47,44323 | 1,81429 |
| 2018 | 5,174292 | 47,61 | 50,91414 | 2,233379 |
| 2019 | 5,01816 | 48,09 | 52,74619 | 1,806662 |
| 2020 | -2,06954 | 47,08 | 54,57823 | 1,40569 |

Source: Data Processed (The World Bank, 2021)

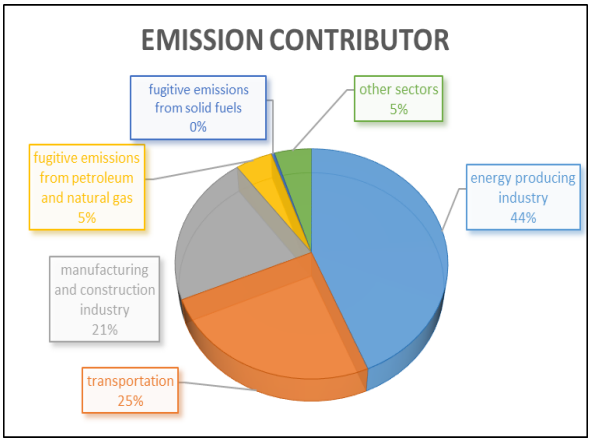
The reduction of emissions is closely related to economic growth that is fueled by human capital. This growth has significant effects on both environmental sustainability and pollution levels (Zhang et al., 2021). The government of Indonesia is steadfast in its determination to minimize the emission of greenhouse gases (GHG) through its ongoing programs, in alignment with the targets set out in the Nationally Determined Contribution (NDC). The NDC aims to achieve a reduction of 29% in emissions by 2030. Emissions play a big part in air pollution, which is bad for the environment and for people's health. These emissions, which result in the air as a result of the burning of fossil fuels such as coal, natural gas, and oil, vary depending on the composition of the fuel and the kind and size of the boiler employed (Omer, 2008).

**Table 2.** Emission Contributor

| No | Sector | Emission Contributor |
|---|---|---|
| 1 | Energy producing industry | 43,83% |
| 2 | Transportation | 24,64% |
| 3 | Manufacturing and construction industry | 21,46% |
| 4 | Fugitive emissions from petroleum and natural gas | 4,81% |
| 5 | Fugitive emissions from solid fuels | 0,42% |
| 6 | Other sectors | 4,84% |
| Total | | 100,00% |

Source: Kementerian Energi dan Sumber Daya Mineral (2020)

**Figure 2.** Emission Contributor




A significant number of politicians pledge their allegiance to human capital investment, including Vocational Education and Training (VET), as a means of ensuring economic expansion. Most policymakers worldwide assume that investing in the study is positive, attaining equality, national prosperity, and higher education (Šipilova, 2013). Some economists suggest that more talented and productive people are more likely to invest in education. To put it another way, education does not inherently make you more productive; rather, it serves as a costly sorting tool for businesses to discover more talented employees.

Weber (2014) argues that the governmental focus on education and skills as the key drivers of economic development exaggerates the significance of human capital investment and that education's primary job is to sort people and to discriminate against them socially to some degree. Understanding the potential economic advantages of education and training for people, businesses, and the broader economy is critical when formulating education and training policy. However, we must acknowledge that distinguishing between education's influence on productivity and wealth and its function as a sorting mechanism is exceedingly difficult. We need to know how various sorts of individuals may efficiently learn skills at different points of their lives, as well as the economic returns on those skills once gained, in order to establish effective policies. This is particularly significant in the realm of VET because worldwide research reveals that certain VETs have poor economic returns.

Finally, even if it is assumed that education and training boost individual labor market productivity, it is unclear if relying only on income is adequate. First, as economic theory argues, salaries do not always precisely represent an individual's level of production. This is definitely not the situation in the public sector, where the state sets the salary of nurses and teachers, for example (though influenced by the prevailing private sector wages). In fact, education is much more than a financial investment; it provides people with a slew of non-monetary advantages. These advantages might include lower crime, improved parenting abilities, and/or improved health results. In traditional rate-of-return studies, the non-economic advantages of education are not taken into account. However, understanding the broader potential advantages of education and training is critical for the formulation of solid policies - especially in the field of VET (Carneiro, Dearden, & Vignoles, 2010).

The only human capital that significantly gives some long-term economic development, but the macroeconomic factors that influence it are yet unknown. It is critical to highlight the primary demand-side drivers of education, utilizing exogenously driven changes in a

country's export composition as a lens for examining how shifting production patterns impact future educational attainment (Blanchard & Olney, 2017).

On the other hand, recent EU unemployment and growth numbers have shown some of the classic view's flaws. Human resources do not seem to provide assurance of financial stability or prompt recuperation from the crisis independently. In contrast, nations like Spain or Cyprus have relatively high levels of human capital, represented as a proportion of the population with a high degree of education. However, unemployment is high and economic development is slow or negative (Čadil, Petkovová, & Blatná, 2014).

The EU Strategy 2020 focuses on three areas of growth: smart, sustainable, and inclusive, all of which need a significant contribution from people's skills, knowledge, and values, also known as human resources. It is difficult to assume that these objectives can be met Devoid of a robust education and training infrastructure, extensive dissemination of knowledge in manufacturing services, innovative industries, and substantial initiatives toward building a research-driven economy. As a result, human capital serves as a growth element. Any delay in investing in human capital will have an impact on these nations' long-term growth (Pelinescu, 2015).

Because EET is growing at a rapid rate throughout the world, effective human capital development Entrepreneurship education and training (EET) are swiftly gaining prominence as a governmental priority. Unfortunately, there is a scarcity of proof to suggest that EET fosters the emergence of superior or more numerous entrepreneurs. Upon scrutinizing the literature through the lens of human capital theory, the initial quantitative evaluation demonstrated compelling evidence endorsing the benefits of EET (Martin, McNally, & Kay, 2013).

The impacts of generalized and company human capital on the direction and volume of exports highlight their distinct effects. Employee experience at work is the sole characteristic of human capital that influences both export propensity and intensity concerning a firm's general human capital (i.e., education of company personnel), whereas employee training has no bearing on either. Furthermore, enterprises' general human capital exerts a more substantial influence on export behavior than specialized human capital (Rodríguez & Orellana, 2019).

The enrollment rate is the decisive factor in the dynamic relationship between school enrolment and employment rate (through the unemployment rate). Increased investment in human capital, particularly through higher education, is thought to enable human capital to evolve dynamically, thereby promoting positive long-term development, according to the endogenous model of new growth theory (Adejumo et al., 2021). Because education-driven growth will create more jobs over time, especially in the near term, this trend is expected to education possesses a multiplier effect in fostering sustainable human resource development. However, it seems that education must be integrated with other complementary factors, including social safety nets, effective governance, private sector expansion, and efficient human resource utilization, to achieve the desired outcomes., in order to maintain adequate human resource development and generate employment over the long term (Rusminingsih & Damayanti, 2021).

In the growth literature, the role of human capital in attaining long-term economic development has been clear. According to the new growth literature (Murphy & O'Reilly, 2019), human capital has a positive effect on economic growth, and new growth research is generally optimistic about this impact. This logic leads to the conclusion that quicker growth is not reliant on human capital stock but rather on its usage as measured by

average working hours. Trade openness and investment, in addition to human capital, are both favorably related to economic growth. Meanwhile, although inflation has little effect on growth, the rate of employment has a negative impact. Furthermore, the study shows that human resource stock has a negative effect on economic development in developing countries, but average working hours have a positive impact on economic growth in rich countries. Finally, it seems that domestic investment and employment levels are the most significant growth variables in developing economies (Tahir, Hayat, Rashid, Afridi, & Bin, 2020).

A mutually reinforcing impact exists between investments in health and investments in education, as seen by the positive impact connection's direction when one variable changes and responds to another. This conclusion is supported by the idea of human capital, which holds that having access to human capital positively affects work performance (Widarni & Bawono, 2022). The need for research related to human capital in economic growth, education, and the environment is quite strong, with various results from previous studies. However, research on human capital in relation to the investment climate is still minimal. In previous studies, it was found that human capital has an impact on macroeconomic growth (Blanchard & Olney, 2017). Still, in other studies, human capital has an impact on economic performance based on improving the quality of individuals, as reflected in education (Pelinescu, 2015). Likewise, research states that economic expansion driven by Human Capital has an impact on environmental sustainability (Zhang et al., 2021), but in other studies, the development of human capital can reduce the impact of environmental pollution investment, as well as other research on financial investment that has an impact on economic growth (Zhang & Wang, 2021).

## LITERATURE REVIEW

Human capital is often mentioned as a determining factor in a country's capacity to compete and grow economically. However, as recent EU unemployment and growth data demonstrate, there are serious flaws in this popular wisdom. Human resources alone do not seem to be sufficient to provide economic stability and a rapid recovery from the crisis. Consider Spain or Cyprus, both of which have a high proportion of their population with a college diploma or above. Regardless, unemployment is high, and economic growth is either flat or negative. Despite the significance of human capital on the long-term development of the Economic, little is understood about its macroeconomic underpinnings. To identify the key demand drivers, exogenous changes in a country's export composition should be utilized as a lens to evaluate how changing production patterns impact future educational attainment (Blanchard & Olney, 2017).

The EU's 2020 strategy's core goals are intelligent, sustainable, and inclusive growth. These objectives can only be met with the assistance of human resources, which are referred to collectively as "human resources" in the EU's plan. It is hard to suppose that these objectives can be met without a robust educational and training system, widespread information transmission in the industrial and creative sectors, and significant efforts to create a research-intensive economy. To put it another way, a lack of investment in human capital may be detrimental to these nations' long-term prosperity (Pelinescu, 2015).

A growing number of governments are focusing on entrepreneurship education and training (EET) as a means of enhancing human capital. Unfortunately, there isn't much data to suggest that EET helps people become better or more successful entrepreneurs. According to the preliminary study, we know that when applied to human capital theory, EET may have a significant positive impact (Martin, McNally, & Kay, 2013).

The trajectory and intensity of exports show that the impacts of public and firm-specific human capital are not equal. Although the education of its employees influences the propensity of exports, certain parts of the human capital (the experience of its employees) impact export propensity but not employee education. Individual human capital's influence on export behavior is less substantial than the company's impact on the entire human capital (Rodríguez & Orellana, 2019).

The rates of school enrollment and employment are inextricably related (through the unemployment rate). To put it another way, investing more in human capital, particularly at the higher levels of education, will enable human capital to develop dynamically, resulting in long-term growth. In the near term, since it creates employment, this trend has a multiplier impact on long-term human resource development. On the other hand, it seems that education must be connected to To ensure long-term human resource development and employment. It is also necessary to consider other factors, such as social safety nets, strong governance, private sector growth, and human resource participation (Rusminingsih & Damayanti, 2021).

Human capital is critical for long-term economic development, as shown by the corpus of growth research. As a result, education has emerged as a critical channel for the development of human capital is essential for achieving long-term development objectives. In the early phases of sustainable development, the new growth theory investigates the influence of education-driven growth (measured in terms of school enrollment rates) on employment rates and patterns (Adejumo et al., 2021). People are becoming more worried about the future of our planet's resources as a result of causes such as dwindling human capital, natural resource depletion, and population expansion (Šipilova, 2013). Over the long term, both human and natural resources have a negative impact on carbon emissions, while economic expansion has a positive impact on carbon emissions. Short-term There is a positive correlation between carbon emissions and population growth as well as economic expansion., while natural resources are negatively correlated. Natural resources have a negative long-term and short-term association with human capital and economic development, but the environmental footprint has a positive long-term and short-term link (Zhang et al., 2021).

China is the world's most polluted nation, grappling with rising CO2 emissions and an ecological imprint. China must understand the elements contributing to environmental contamination and take significant actions before it is too late (Zhang & Wang, 2021). Globalization, trade openness, and incomes all contribute to environmental damage; however, developing human capital has a long-term beneficial effect on reducing the ecological footprint. Consumption of renewable energy had little impact. This research demonstrates that human resources are critical for reversing the environmental deterioration in China and that renewable energy alone is inadequate to achieve ecological standards (Pata & Caglar, 2021).

Financial advancements have a measurable beneficial impact on economic growth (Murniati and Hidayat, 2021). Human resources can contribute to economic progress in underdeveloped nations. In emerging countries, finance and the development of human capital have a significant and positive impact on economic growth (Sarwar, Khan, Sarwar, & Khan, 2020; Murniati, Maski, Noor, & Ekawaty, 2021a).

The new growth literature is often somewhat optimistic about human capital's beneficial effect on a country's economic development (Murphy & O'Reilly, 2019). Based on this logic, what matters for more significant growth is determined. The key factor for human capital is its stock and utilization, which can be measured in terms of average working hours. Apart from human capital, openness to commerce and investment also contribute

to development. On the other side, inflation has a negligible effect on growth, while the employment rate negatively impacts. Additionally, the research demonstrates that for emerging nations, the stock of human resources negatively influences economic development while the average working hours have a beneficial effect. Finally, It appears that growth is mainly driven by domestic investment and employment levels in emerging nations (Tahir, Hayat, Rashid, Afridi, & Bin, 2020).

The positive relationship between health and education investments changes direction depending on how one variable reacts to the other, suggesting that these investments mutually reinforce each other. This is in line with the human capital theory, which asserts that an employee's personal attributes have a positive impact on his or her ability to accomplish their professional duties (Murniati, Maski, Noor, & Ekawaty, 2021b; Murniati, 2018). Previous research has yielded mixed results on the effects of human capital on the economy, education, environment, and investment. However, research on human capital and investment in Indonesia is still minimal. Likewise, research on human capital in Indonesia related to the environment is still minimal. This is a strong reason to conduct research and investigations on the importance of human capital in the Indonesian economy (Murniati et al., 2021a).

Human capital contributes to various sectors in Indonesia, but this research examines the importance of human capital and gives mixed results. The diversity of human capital research results is our motivation in analyzing the role of human capital in improving education, economic growth, reducing emissions, and improving the investment climate in Indonesia.
Based on the literature review from previous research, we conclude tentatively in the form of a hypothesis as follows:
H1: human capital has an impact on macroeconomic growth
H2: human capital has an impact on economic performance based on improving the quality of individuals as reflected in education
H3: Economic expansion driven by Human Capital has an impact on environmental sustainability
H4: Human Capital development can reduce the impact of environmental pollution
H5: financial investment has an impact on economic growth.

## RESEARCH METHOD

To determine the causal link between variables, this study used "autoregressive vectors" modeling across a 21-year period from 2000 to 2020. Secondary data from the World Bank and the Kementerian Lingkungan Hidup dan Kehutanan are the foundation of this study (KLHK). We take into account Indonesia's economic development, labor force participation, investment, level of education, and emission reductions. In Indonesia, the following multivariate regression model was used to examine the relationship between economic development, labor force participation, investment, educational attainment, and emission reductions:

$$EG_t = \beta_0 + \beta_1 LP_t + \beta_2 E_t + \beta_3 I_t + \beta_4 ER_t + e_t \quad \text{eql 1}$$
$$LP_t = \beta_0 + \beta_1 EG_t + \beta_2 E_t + \beta_3 I_t + \beta_4 ER_t + e_t \quad \text{eql 2}$$
$$E_t = \beta_0 + \beta_1 EG_t + \beta_2 LP_t + \beta_3 I_t + \beta_4 ER_t + e_t \quad \text{eql 3}$$
$$I_t = \beta_0 + \beta_1 EG_t + \beta_2 LP_t + \beta_3 E_t + \beta_4 ER_t + e_t \quad \text{eql 4}$$
$$ER_t = \beta_0 + \beta_1 EG_t + \beta_2 LP_t + \beta_3 E_t + \beta_4 I_t + e_t \quad \text{eql 5}$$

Description :

EG : economic growth
LP : labor participation
E : education
I : Investment
ER : Emission Reduction
β : the magnitude of the effect of causality
t : time series
e : error term
eql: equation

Each regression connection in this study is merged into a vector, which alternates each variable's status as a dependent and independent variable. The unit root test in this study was conducted using the equation shown below:

$\Delta Y1 = \alpha 0+\beta 0T+\beta 1Yt-1+\sum\_(i-1)^q\ \alpha 1\Delta Yt-1+et$
and the following are the null and alternate hypotheses:
Null hypothesis: $\alpha=0$
alternate hypothesis: $\alpha\neq 0$

## RESULTS

### Stationery Test

Prior to satisfying one of the causality and VAR assumptions, a stationarity test is necessary. Because the ADF test considers the potential of autocorrelation in the error term if the series being tested is non-stationary, it is employed in the unit root inquiry and will also be used to assess the normality of research. The findings of the unit root test were as follows:

**Table 3.** Unit Root Test Result

| Variable | Unit Root | ADF Test stat. | 5% Critical Value | Description |
|---|---|---|---|---|
| Economic Growth (EG) | Level | -0.527808 | 0.8660 | |
| | First Diff | -1.929268 | 0.3129 | |
| | Second Diff | -3.319458 | 0.0293 | Stationer |
| Education (E) | Level | 0.330179 | 0.9721 | |
| | First Diff | -5.019844 | 0.0012 | Stationer |
| Labor Participation (LP) | Level | -2.412304 | 0.1510 | |
| | First Diff | -4.563916 | 0.0024 | Stationer |
| Invesment (I) | Level | -4.058615 | 0.0059 | Stationer |
| Emission Reduction(ER) | Level | -4.372126 | 0.0032 | Stationer |

The stationer at original data is the I and ER data, the E and LP data, stationer at first difference. The EG data is stationary on the second difference. Because all data are stationary, at this point on, we can continue with vector analysis.

### Optimum Lag Test

Finding the ideal acceptable pause length is crucial before doing a VAR or causality test analysis. The appropriate time lag in this experiment was determined using the shortest or lowest Akaike Information Criterion (AIC). As the data utilized in this test are yearly

data with a 21-year data period, the gap length spans from 0 to 2. This delay is deemed long enough to describe EG, E, LP, I, and ER on a yearly basis.

**Table 4.** Optimum Lag Test Result

| Lag | LogL | LR | FPE | AIC | SC | HQ |
|---|---|---|---|---|---|---|
| 0 | -158.0947 | NA | 148.2515 | 19.18762 | 19.43268 | 19.21198 |
| 1 | -123.8300 | 44.34263* | 58.37230 | 18.09764 | 19.56802 | 18.24380 |
| 2 | -84.08146 | 28.05777 | 30.10757* | 16.36252* | 19.05822* | 16.63048* |

Lag 2 will be selected because the results of all four criteria are identical, marked with *. So, these five variables have no preliminary effect based on the data, so lag 2 is an ideal lag with an FPE criterion of 30.10757.

**VAR Model Analysis**
The data was found to be stationary, as shown in table 4. Although it was not stationary at the same level, it indicated that these variables could be analyzed using VAR.

**Table 5.** VAR model analysis

| | **E** | **EG** | **ER** | **I** | **LP** |
|---|---|---|---|---|---|
| E(-2) | 0.102195 | -0.364094 | -4.624971 | -0.097543 | -0.326638 |
| | (0.58090) | (0.11228) | (2.19430) | (0.29787) | (0.39164) |
| | [ 0.17593] | [-3.24267] | [-2.10772] | [-0.32747] | [-0.83402] |
| | | | | | |
| EG(-2) | 0.475549 | -0.219350 | -0.108382 | -0.261775 | -0.273811 |
| | (1.13993) | (0.22034) | (4.30599) | (0.58453) | (0.76854) |
| | [ 0.41717] | [-0.99552] | [-0.02517] | [-0.44784] | [-0.35627] |
| | | | | | |
| ER(-2) | -0.011934 | -0.019125 | -0.517422 | 0.047376 | 0.037773 |
| | (0.11534) | (0.02229) | (0.43569) | (0.05914) | (0.07776) |
| | [-0.10347] | [-0.85787] | [-1.18760] | [ 0.80104] | [ 0.48575] |
| | | | | | |
| I(-2) | 1.969537 | -0.164167 | -5.953366 | -0.453267 | -0.445180 |
| | (1.19016) | (0.23004) | (4.49570) | (0.61029) | (0.80240) |
| | [ 1.65485] | [-0.71363] | [-1.32423] | [-0.74271] | [-0.55481] |
| | | | | | |
| LP(-2) | -0.408186 | -0.563585 | -9.028615 | -0.288166 | -0.628588 |
| | (1.02876) | (0.19885) | (3.88604) | (0.52752) | (0.69359) |
| | [-0.39678] | [-2.83425] | [-2.32335] | [-0.54626] | [-0.90629] |
| | | | | | |
| C | 69.07110 | 61.76457 | 744.9131 | 57.01984 | 100.1653 |
| | (123.932) | (23.9547) | (468.141) | (63.5496) | (83.5546) |
| | [ 0.55733] | [ 2.57839] | [ 1.59122] | [ 0.89725] | [ 1.19880] |

| | | | | | |
|---|---|---|---|---|---|
| R-sq. | 0.831437 | 0.849392 | 0.752963 | 0.495534 | 0.715853 |
| Adj. R-sq. | 0.550500 | 0.598379 | 0.341236 | -0.345243 | 0.242275 |
| Sum sq. resids | 23.00282 | 0.859399 | 328.2216 | 6.048386 | 10.45575 |
| S.E. equation | 1.958010 | 0.378461 | 7.396189 | 1.004024 | 1.320085 |
| F-statistic | 2.959510 | 3.383855 | 1.828789 | 0.589376 | 1.511583 |
| Log likelihood | -26.69238 | 1.248300 | -49.28600 | -15.33787 | -19.99043 |
| Akaike AIC | 4.434398 | 1.147259 | 7.092470 | 3.098573 | 3.645933 |
| Schwarz SC | 4.973536 | 1.686397 | 7.631609 | 3.637711 | 4.185071 |
| Mean dependent | 44.16298 | 5.390172 | 0.129412 | 1.761337 | 47.96882 |
| S.D. dependent | 2.920452 | 0.597191 | 9.112612 | 0.865653 | 1.516513 |

The analysis indicates that there are significant relationships between EG and its variables. The correlation between EG and its own self exhibits a remarkably adverse connection, indicated by a coef of -0.219350 and a t-stat of 0.22034. Conversely, the correlation between EG and E showcases a notably constructive relationship, illustrated by a coef of 0.475549 and a t-stat of 1.13993. This means that when EG increases, so does E. Furthermore, the relationship between EG and ER is significantly negative, with a coef of -0.108382 and a t-stat of 4.30599. This suggests that when EG increases, ER decreases. The coef of -0.019125 and t-stat of 0.02229 provide further evidence for this. In summary, the results suggest that high economic growth can lead to increased education levels. However, it can also cause a reduction in emissions reductions.

**Granger Causality Test**

**Table 6.** The Granger Causality Test

| H0 | Obs | F-Stat. | Prob. |
|---|---|---|---|
| LP not Granger EG | 19 | 0.10306 | 0.9028 |
| EG not Granger LP | | 0.14968 | 0.8623 |
| E not Granger EG | 17 | 0.27521 | 0.7641 |
| EG not Granger E | | 0.02294 | 0.9774 |
| I not Granger EG | 19 | 0.87993 | 0.4365 |
| EG not Granger I | | 0.70042 | 0.5130 |
| ER not Granger EG | 19 | 0.47358 | 0.6324 |
| EG not Granger ER | | 0.03132 | 0.9692 |
| E not Granger LP | 17 | 0.44269 | 0.6524 |
| LP not Granger E | | 0.81165 | 0.4671 |

As the significance threshold is less than or equal to 0.05, the Granger causality Analysis findings with the EG, E, LP, I, and ER variables demonstrate that there is no one-way connection and reject H0.

## DISCUSSION

This research is a complement to previous studies that have ambiguity. In this study, we examine the causality between various variables in human capital using vector analysis. The data used in this study is secondary data with samples from 2000 to 2020. From the results above, the statistical analysis reveals that there is some significant bad association between EG with I. The -0.261775 coefficient has a 0.58453 t-statistic, indicating that the greater the EG, the lower I. When EG increases (in GDP), followed by a decrease in I which is strengthened by the indicator of the relationship between LP and EG, which is negative and not significant with a coefficient of -0.563585 and a t-stat of 0.19885. However, the connection between ER and EG is significantly negative. The analysis shows that there is a very significant, inverse connection between EG and LP,

with a -0.273811 coefficient and t-stat and a coefficient of -0.019125 and a t-stat of 0.02229. That means if there is some lower in the emission reduction or an increase in emissions, there is a corresponding increase in the economic growth of 0.76854, which means that ER and LP are difficult to indicators of each other without the presence of an EG indicator.

## CONCLUSION

Increased economic growth will also result in higher labor participation rates. Still, it will also result in a drop in Indonesia's investment climate, which will raise emissions while simultaneously encouraging higher levels of education. As investment declines, labor participation will rise as well. Future research should attempt to associate total investment with the level of labor participation in Indonesia because this study has a flaw in that it only considers "foreign investment," not the whole amount of investment.

**ACKNOWLEDGMENT**
N/A

**DECLARATION OF CONFLICTING INTERESTS**
The authors declared no potential conflicts of interest

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