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Sustainability Strategy to Alleviate Poverty Through Education, Energy, GRDP, and Special Funds: Evidence from Indonesia

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ABSTRACT

This study discusses the approach to poverty alleviation that occurs in Indonesia, reviewed by using four variables that match the situation. The simulation based on our approach model applies an integrated and multidimensional approach that combines elements of various approaches to alleviating the poverty. This research uses cross-sectional data from 501 regencies and cities the Republic of Indonesia. The data is analyzed using OLS multiple regression with robustness. In addition, this study offers policies for the government to design, manage, and implement poverty alleviation programs. This study enriches the poverty alleviation literature in knowledge capture and sample adequacy. The findings of this study indicate that not all selected independent variables affect the poverty. There are four variables studied in this study, namely, literacy, electricity energy, and GDRP with oil. From the four variables, only three significantly affect the poverty as dependent variable. The most surprising thing is that the special allocation fund variable has an expected sign on its coefficient contrary to the hypothesis. Therefore, the special allocation fund does not support the poverty alleviation throughout the cities and districts in Indonesia. Findings of this study confirm, to some extent, the complementarity of the independent variable to the dependent variable and various approaches to poverty alleviation that need to be employed comprehensively.

1. INTRODUCTION

Poverty alleviation becomes one of the significant programs in a government concerned about the welfare of its citizens [1, 2] for the long-term sustainability. Thoughts on this have developed, but they are fundamentally related to the inability to meet the basic needs of particular people [3, 4]. Poverty demonstrates total deprivation that occurs not because the poor people want it but because they are unable to escape with their strength [5, 6].

According to data from the Central Bureau of Statistics of the Republic of Indonesia (BPS RI), in 2020, the poverty condition in Indonesia from March 2011 to March 2020 is depicted in Figure 1 below.

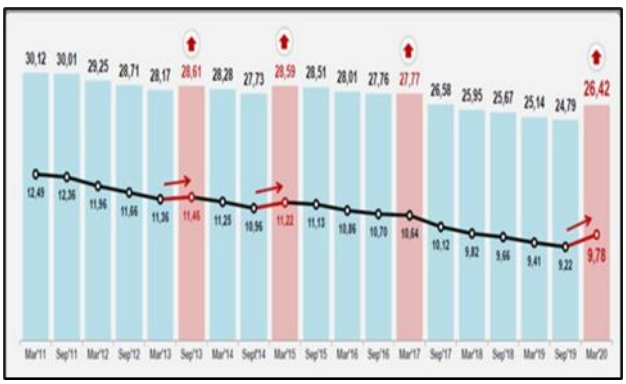

Figure 1. Poverty percentage in Indonesia

Figure 1 above shows that there has been a decline over the last 9 years in Indonesia, but there has been an increase in the number of poor people in September 2013, March 2015, March 2017, and March 2020. The increase in fuel oil and gas prices is the reason of the growth in poverty, because the government wants to eliminate subsidies to protect the state budget while people's purchasing power declines. In 2020, there was a COVID-19 attack in all parts of the world, including the Republic of Indonesia. Thus, the poverty rate rises but is not as severe.

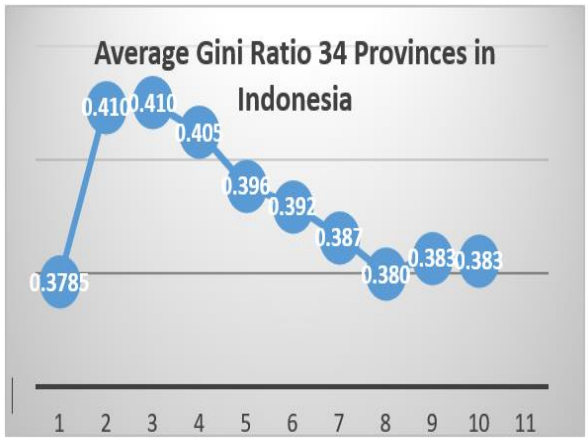

Figure 2. Average of the GINI ratio of all provinces in Indonesia

The next issue is that continuous direct cash assistance does not reach the weakest members of society. The COVID-19 pandemic that hit the world generated an increase in the number of poor people in the final quarter of 2020. Considering that the COVID-19 pandemic has affected the upper-middle class and the poorest, then government must focus on the poverty alleviation through a holistic strategy [7, 8]. The poverty and income inequality often exhibit a unidirectional pattern of change. According to previous researches, when there is an increase in the poverty rate, the inequality also increases, and vice versa [9, 10].

Inequality of ownership of productive assets in an area is the root cause of both short-term and long-term inequality or poverty. To avoid poverty in the area, the central authorities or local government must be concerned about this issue [11, 12]. Figure 2 describes the change in the average GINI ratio in all provinces in the Republic of Indonesia.

Figure 2 above describes the dynamics of the GINI ratio coefficient which drastically increases and decreases overall in a short period of time. It climbs little in the last period, and the poverty increases (see Figure 2).

The poverty can be caused by natural and economic conditions, structural and social needs, politics and policy regimes, and cultural conditions [13-15]. Natural and economic poverty develops from limited natural, human, and other resources; therefore, production opportunities are relatively limited and cannot contribute to the development [16-18]. Structural and social poverty is rooted in uneven development results, institutional arrangements, and development policies [19-21]. Meanwhile, cultural poverty is caused by attitudes or life habits that feel sufficient to trap someone in the poverty and make moving on difficult [22]. The poverty is caused by both internal and external factors, such as the low quality of human resources and the individual's attitude [23, 24]. Meanwhile, external causes are limited natural resources, social and institutional arrangements in society, development policies, limited job opportunities, and competition that marginalize the poor.

Poverty Alleviation Program Strategy in Indonesia

The strategic development target of the National Medium-Term Development Plan in Indonesia for 2020-2024 is to create an independent, advanced, just, and prosperous Indonesian society through accelerated development in various fields [25, 26]. Development programs are projected sustainability strategies based on competitive advantages in multiple regions supported by qualified and competitive human resources [27, 28]. The strategy to alleviate the poverty as proposed by Adler-Karlsson and other researchers, as quoted by [29-31], includes (1) *short term strategy*, done by transferring resources to people experiencing poverty in sufficient quantities. Short-term poverty improvements include creating job opportunities, increasing income, and improving its distribution, including the cash transfer action by the previous Indonesian regime; (2) *long-term strategy*, done by strengthening local self-help. The long-term improvement is done by improving and fulfilling the dignity of life on an individual and social level. The poverty reduction strategy implemented by the government can be divided into two major parts: protecting families and community groups experiencing temporary poverty and assisting communities experiencing chronic poverty by empowering and preventing new poverty from occurring. The strategy is outlined in three programs directly directed at the poor: (1) provision of basic needs; (2) development of social security system; and (3) business culture development. In addition, the poor have strategies for overcoming the poverty. The strategies adopted include borrowing from informal institutions, increasing working hours, family members working, migrating, or saving money.

Traditions and the planning strategy driving them distringuish the policy principles that the government often implements for the poverty alleviation programs [32, 33]. According to John Friedmann, there are at least four types of planning traditions: (1) planning as social reformation, in which the state prepares and plans various development directions and guidelines to be followed and implemented by the community with good guidance; (2) planning as policy analysis, in which policymakers (the government and other related parties) compile and plan various development directions and guidelines based on scientific data analysis that can be accepted and implemented by the community; (3) planning as social learning, in which planning knowledge is obtained through experience and refined through practices (learning by doing), development planning and implementation are carried out in collaboration with the community with expert guidance; and (4) planning as social mobilization, in which the development planning must be carried out by the community and driven by various concepts/ideologies embedded in their souls and culture.

Meanwhile, recent types of poverty alleviation programs implemented by the government can be seen based on the development model that underlies these programs to see the emphasis of the strategy implemented by the program [34]. The development models adopted by developing countries generally can be classified into four types [35-37]. The Development Model Strategy can be applied as follows: (1) focuses on national income growth; (2) focuses on equity and the fulfillment of basic needs; (3) attempts to improve the quality of human resources through community and target group participation in assessing needs and participation in the development process. The development model (4) then focuses on strengthening competitiveness in the face of globalization and regional autonomy.

According to previous studies, the government policies implemented through the distribution program of the Special Allocation Fund (SAF) should be able to lower poverty levels in all target areas. Nevertheless, it is different as reported by Indonesia Corruption Watch (ICW) based on their results of monitoring in the period of 2006-2015, the special allocation funds (SAF) in the education sector were the most corrupt object of funds. There have been 85 SAF corruption cases in the last 10 years, resulting in state losses of IDR 377 billion. The budget allocation policy should have resulted in favorable economic growth, yet the opposite has occured. In other words, it only moves slowly, and the inequality is acute.

The poverty alleviation programs can be evaluated based on their planning approach, development model, and implementation. Criteria used to evaluate the implementation of the poverty alleviation program include setting targets and data used to determine the targets; the role of local governments, the public, and program target recipients; and program implementation at the government and community levels. Based on the above description, which to the best of authors' knowledge has never been explored in previous studies, it is critical to review it using a new and unique econometric model. The econometric model used to explore the allocation funds and other variables for the Poverty Gap Index (PGI) is the novelty of this study. For this reason, the

authors write this manuscript, so that it is presented in a scientific and structured manner.

2. LITERATURE REVIEW

Variable Special Allocation Funds (SAF) are funds budgeted by the Central Government through the State Revenue and Expenditure Budget-APBN, which are earmarked for certain regions to help finance special activities in those areas. So therefore, authors attempt to develop research hypotheses based on the background phenomena. Furthermore, this research employs established theories and explores previous researches to support the new model and perspective. The partial testing of each independent variable on the dependent variable is carried out by t-test with a significance level of 5%. A study by Spaull [38] found that the strong legacy of apartheid and the consequent correlation between education and wealth, had resulted in poorer South African students performing worse academically. Furthermore, Allen [39] investigated the impact of population, enclosure, empire, representative government, technology, and literacy on urbanization, agricultural productivity, proto-industry, and the real wage in his work. Simulations highlight the primary characteristics that contribute to economic success in north-western Europe [40, 41].

Larson and his fellow researchers [42] explored the effects of participation in these programs for adult learners: increased self-confidence, social efficacy, and, to a lesser degree, critical social involvement. Adult literacy programs view education for adults from a deficit perspective, with the learners perceived as lacking in skills or abilities, decent education that would allow them to contribute more fully to a stronger economy [43, 44]. Considering this, the literacy and sustainable education variables will have an impact onthe PGI. Subsequently, the null hypothesis (H_0) and alternative hypothesis (H_1) can be used for partial testing on the β_1 parameter as follows:

H_0: $\beta_1=0$, Literacy (Lit) does not affect the PGI.

H_1: $\beta_1<0$, the Literacy (Lit) affects the PGI negatively.

Furthermore, based on the research results, several economists stated that the role of education, as well as training, is very important in alleviating the poverty, and this has been studied by researchers all over the world [45-47]. Other studies also stated that the quality of education would cause a person to only be able to access employment with higher productivity and wages or income because of the ability of productivity as well so that it can increase a better standard of living as well [48-50].

In Indonesia, energy poverty primarily affects rural communities that are generally isolated and distant [51-53]. On the one hand, Indonesia's typical household energy consumption exceeds the bare requirement. However, on the other hand, a large portion of the population continues to lack acess to energy-related services. The energy poverty in the rural communities as well as in the suburbs creates a number of environmental, social, and economic issues [49, 54]. Due to the lack of access to modern energy sources, the households use forest wood as an energy source, resulting in forest damage [4, 55, 56].

It is obvious that there is an inequality in the household energy consumption in Indonesia compared to neighboring countries, such as Singapore, Brunei, and Malaysia. Therefore, a separate model depicting how the electricity influences the PGI can be developed. The null hypothesis (H_0) and the alternative hypothesis (H_1) for partial testing on the β_2 parameter are as follows:

H_0: $\beta_2=0$, the Household Electricity Access (HHElt) does not affect the PGI.

H_1: $\beta_2<0$, the Household Electricity Access (HHElt) affects the PGI negatively.

Several studies found a significant positive relationship between electricity availability and well-being in rural and urban households [57, 58]. However, only for the rural households did electricity accessibility demonstrate a significant positive relationship [59-61]. The relationship between the well-being, electricity access, and availability is easily quantifiable, consequently, the use of renewable energy sources as a source of electrical energy is extremely appropriate to alleviate the problem of energy poverty exists in rural areas of Indonesia [62, 63]. The paper closes with implications for electrical policy and infrastructure decisions for national development [59, 64].

In both rural and urban areas, access to household electricity is positively related to community welfare [65]. According to Ferguson and other researchers, they conclude that rich countries have a stronger correlation between electricity use and wealth creation than the poorer countries, and that there is a stronger correlation for the global economy as a whole [66, 67]. Furthermore, there is a stronger relationship between the electricity use, productivity growth, and economic advance. This study also shows that, in rich countries, an increase in wealth over time is correlated with an increase in the e/E ratio [68, 69]. The results imply that the energy ratio ($/toe) should be replaced by the electricity ratio ($/kWh) as an indicator of development and, more precisely, by the e/E ratio (kWh/toe) as argued by the study [70].

The problem of income inequality and poverty is not limited to developing countries; yet, developed countries cannot be isolated from this problem, thus, the contribution of energy and human development is critical [71, 72]. The difference is found in the gap between proportion and the poverty rate. The area and population of a country influence the level of difficulty in overcoming it [73]. The greater the poverty rate, the more difficult it is to overcome if other value contributions do not work accordingly [71, 74].

It is undeniable that gross regional domestic product (GRDP) significantly decreases the PGI. In this study, a research model is developed as an econometric equation. The null hypothesis (H_0) and the alternative hypothesis (H_1) for partial testing on the β_3 parameter are as follows.

H_0: $\beta_3=0$, the GRDP with oil (GRDPwO) does not affect the PGI.

H_1: $\beta_3<0$, the GRDP with oil (GRDPwO) affects the PGI negatively.

Special Allocation Funds (SAF) are funds sourced from State Revenue and Expenditure Budget-APBN revenues allocated to specific regions to assist in funding special activities related to regional affairs and national priorities [75, 76]. Programs that become national priorities are defined in the Government Work Plan for the relevant fiscal year [77]. After consulting with the Minister of Home Affairs of the Republic of Indonesia, the technical minister proposes specific activities to be supported by the SAF and is resolute.

As a result, the SAF will reduce the poverty by lowering the PGI. Furthermore, an econometric equation is used to develop a research model in this study. Therefore, the null hypothesis

(H_0) and the alternative hypothesis (H_1) for partial testing on the β_4 parameter are as follows:

H_0: $\beta_4=0$, the SAF does not affect the PGI.

H_1: $\beta_4<0$, the SAF affects the PGI negatively.

Furthermore, the poverty is well-defined as an individual living in a household with a daily spend of no more than US $ 1 per day per person in international pricing. The PGI is an average measure of the expenditure gap of each poor population relative to the poverty line. The higher the PGI, the greater the distance between the average population expenditure and the poverty line [5]. In this study, the general PGI formula is written in Eq. (1) as follows:

$$PGI = \sum_{i=1}^{q}\left[\frac{z-y_i}{z}\right]^{\alpha} \quad (1)$$

α: the degree of aversion to the poverty, so that as the amount recognized to the poorest households increases 1;

z: poverty line;

q: the number of low-income households will be discussed below;

yi: average monthly expenditure per capita of the population living below the poverty line, where the mathematical equation is,

a person is poor if y_i<z;

n: total population.

The poverty, as previously explained, is a multidimensional concept in social life.

3. METHODS

3.1 Basic framework

This study employed cross-section datafrom 501 residences & municipalities throughout the whole provinces of Indonesia in 2021. The data was obtained from 514 districts and cities across Indonesia, although several districts and cities could not be analyzed accordingly. This case happened because 13 regencies/cities did not have complete data, so that they were unable to complete the statistical and econometric calculations (not available) used in this study. Based on the issues and possible causal relationships between Lit15, HHElt, Ln (GDRPwO), Ln(SAF) with the PGI, the output of compilation toward economic models is then depicted in the following figure.

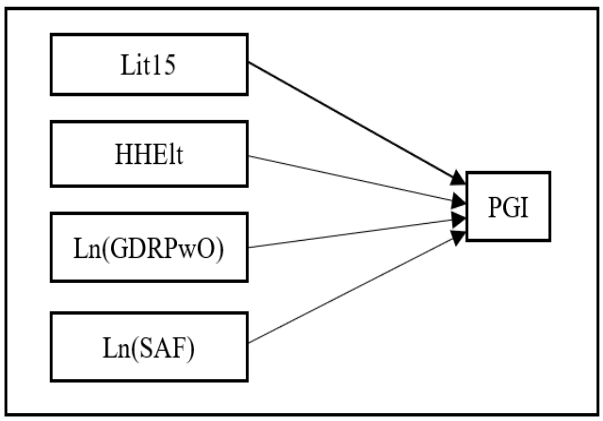

Figure 3. Research model

Figure 3 describes that the independent variables of this study include Lit15, HHElt, Ln (GDRPwO), and Ln (SAF) towards PGI. Considering of Figure 3 above, the following Eq. (2) can be written as follows:

$$PGI_i = \beta_0 + \beta_1\, Lit15_i + \beta_2\, HHElt_i + \beta_3\, Ln\left(GDRPwO\right)Ln(GDRPwO)_i + \beta_4 \ln\left(SAF\right)_i + \varepsilon_i \quad (2)$$

The classical assumptions used in this study must meet multiple regression requirements, where the need to pay attention to the variance of the error is constant. This assumption explains that the response variable has the same variance as long as the value of the independent variable meets the predetermined conditions.

3.2 Classical assumption test

Classical assumptions in multiple regression must be met in order for the regressor parameter estimator to achieve the best linear unbiased (BLUE). The authors applied the multicollinearity and heteroscedasticity test to the cross-section data of 501 districts and cities in one observation period.

3.2.1 Multicollinearity test

When the regressors were highly correlated but not perfectly correlated, applied researchers faced the following number of problems: small changes in the data cause large swings in the parameter estimates; coefficients may have very high standard errors and low significance levels although they are jointly significant; the R^2 for the regression is relatively high, and coefficients may have the wrong" sign or implausible magnitudes.

The presence of multicollinearity in a regression model was examined using the variance Inflating factor (VIF), as shown in Eq. (3) below:

$$VIF = \frac{1}{1-R^2} \quad (3)$$

then, see: Eq. (4):

$$R^2 = \frac{\sum\left(y_{\text{calculated}} - \bar{y}\right)^2}{\sum\left(y_{\text{given}} - \bar{y}\right)^2} \quad (4)$$

The measure of multicollinearity is as follows:

VIF=1, which means not correlated, or the multicollinearity does not exist.

VIF between 1 and 5 means that it is moderately correlated, or low multicollinearity exists.

VIF is more significant than five and highly correlated, or a high multicollinearity exists.

Tolerance was the inverse of VIF and is written in Eq. (5) as follows:

$$\text{Tolerance} = \frac{1}{VIF} = 1 - R^2 \quad (5)$$

When $R^2=0$, there is no collinearity present, and in the next stage, it can be concluded that the tolerance is high (=1).

The authors can then use other techniques to resolve this issue of multicollinearity if the extent is too great.

3.2.2 Heteroscedasticity test

As usual with Ordinary Least Square (OLS) regression, it was necessary to investigate the violation of the heteroscedasticity assumption to fulfill the BLUE attribute. Homoscedasticity occurred if the variance was expected to be constant. Meanwhile, if all the disturbance factors did not have the same variance (a variant is not constant), this condition of non-constant variance or non-homogeneous variance was called heteroscedasticity. Therefore, disturbance U would present a heteroscedasticity problem if $Var(U_i) \neq \sigma_i{}^2$ was the variant that varied, so that the model was suspected of having heteroscedasticity.

3.3 Linear regression test

Further, the econometrics and statistical methods were used to examine the model and its respective parameters [78]. The unknown parameters of the stochastic relation of $y_i = x_i'\beta + \varepsilon_i$ are the objects of estimation. It was necessary to distinguish between the population quantities, such as β and ε_i. The sample estimates are denoted as b and e_i. The population regression is $E[y_i|x_i] = x_i'\beta$, whereas the authors' estimate of $E[y_i|x_i]$ is written in Eq. (6) as follows:

$$\hat{y}_i = x_i'\beta \tag{6}$$

The disturbance associated with the *i-th* data point in Eq. (7) is as follows:

$$\varepsilon_i = y_i - x_i'\beta \tag{7}$$

For any value of b, the authors estimate ε_i with the residual presented in Eq. (8) as follows:

$$e_i = y_i - x_i'\beta \tag{8}$$

From the above definitions, the regression model as suggested [78] can be written in this following Eq. (9):

$$y_i = x_i'\beta + \varepsilon_i = x_i'\beta + e_i \tag{9}$$

This study used the cross section data from 501 districts and cities in Indonesia. If there was no heteroscedasticity problem, the authors would simply use the results of this OLS linear regression calculation.

3.4 Robust least square estimation

The robust least square estimation method eliminated the heteroscedasticity; therefore, this study used the robustness calculation. In the generalized regression model, the disturbances might be heteroscedastic, auto-correlated, or both. The least-squares estimator was the estimator written in Eq. (10) as follows:

$$b = \beta + \left(X'X\right)^{-1} \sum_{i=1}^{n} X_i \varepsilon_i \tag{10}$$

X refers to the matrix of the independent variable, and n is the number of observations.

The authors seek an estimator of the variables see Eq. (11)

$$* = p\lim\left(1/_n\right)\frac{1}{n}\sum_{i=1}^{n}\sigma_i^2 X_i X_i' \tag{11}$$

Greene states in the studies [79, 80] that under very general conditions, the estimator S_0 could be highlighted in Eq. (12) as follows:

$$S_0 = \frac{1}{n}\sum_{i=1}^{n} e_i^2\, X_i X_i' \tag{12}$$

Eq. (11) has plim S_0=Q_*. The end of the result shows that White heteroscedasticity is a consistent estimator which can be written in Eq. (13) as follows:

$$\begin{aligned} &Est.Asy.Var[b] \\ &= \frac{1}{n}\left(\frac{1}{n}X'X\right)^{-1}\left(\sum_{i=1}^{n} e_i^2\, X_i X_i'\right)\left(\frac{1}{n}X'X\right)^{-1} \\ &= n(X'X)^{-1}S_0(X'X)^{-1} \end{aligned} \tag{13}$$

Thus, based on the OLS method that considered the robustness, an estimator that met the BLUE results would be obtained.

4. FINDINGS AND DISCUSSION

The authors examined the classical assumption first, followed by the linear regression to determine the causal relationship between the variables.

4.1 Classic assumption test

Before performing the regression testing, the authors must perform tests on the data to ensure that the classical assumptions were met, resulting in the BLUE coefficient estimator results.

4.1.1 Multicollinearity test

This test was performed to understand whether there was a relationship between the independent variable to obtain the VIF value.

Table 1. Results of multicollinearity test

Variable	VIF	1/VIF
Lit15	1.74	0.57
HHElt	1.39	0.72
Ln(GDRPwO)	1.35	0.74
Ln(SAF)	1.03	0.97
Mean of VIF	1.38	

Source: Processed data, 2022

Based on the results in Table 1 above, express that all the VIF values of the independent variables are lower than 5. Therefore, it could be concluded that there is no relationship between the independent variables (mmulticollinearity)

4.1.2 Heteroscedasticity test

In statistical calculations, the heteroscedasticity must be considereed, which happened when the standard deviation of the predicted or monitored variable at a value different from the independent variable or related to the previous of a particular period pattern of *time* is not constant. If the

heteroscedasticity existed in the residual, the estimation results would not meet the BLUE. The estimation results from the model from the basic framework in question would produce an error value like $\hat{\varepsilon}_i^2$. Furthermore, the following Eq. (14) is shown below as the appropriate econometric equation to detect the presence of heteroscedasticity:

$$\begin{aligned}\widehat{U}_i^2 = {} & \alpha_0 + \alpha_1\, Lit15_i + \alpha_2\, HHElt_i \\ & + \alpha_3\, Ln(GDRPwO)_i \\ & + \alpha_4\, Ln(SAF)_i + \alpha_5\, Lit15_i{}^2 \\ & + \alpha_6\ HHElt_i{}^2 \\ & + \alpha_7\, Ln(GDRPwO)_i{}^2 \\ & + \alpha_8\, Ln(SAF)_i{}^2 + \varepsilon_i\end{aligned} \tag{14}$$

The error variance was assumed to be a function of the the independent variables, the square of each independent variable, and the interaction between the independent variables in this study. Therefore, the heteroscedasticity test was performed.

4.1.3 Breusch-pagan test

The results of Breusch-Pagan/Cook-Weisberg test for heteroscedasticity can be seen in the following Table 2.

Table 2 above shows that the probability value of the chi-square statistic is less than 0.05. Therefore, the null hypothesis of constant variance cannot be supported empirically at a 5% significance level. It implied the presence of heteroscedasticity in the residual.

Table 2. Results of breusch-pagan/cook-weisberg test for heteroscedasticity

Ho: Constant variance
Variables: fitted values of PGI
Chi2(1)=227.93
Probability of Chi2=0.0000

Source: Processed data, 2022

4.1.4 White test for heteroscedasticity

White test method was performed to see the results of the heteroscedasticity test in the model proposed in this study. The results of White test can be seen in the following Table 3:

Table 3. Results of white test for ho: homoscedasticity

Chi2 (14)=77.69			
Probability of Chi2=0.0000			
Relative to Ha: unrestricted heteroscedasticity			
Cameron & Trivedi's decomposition of IM-test			
Source	Chi2	df	p
Heteroscedasticity	77.69	14	0.0000
Skewness	25.52	4	0.0000
Kurtosis	7.72	1	0.0055
	110.93	19	0.0000

Source: Processed data, 2022

The results of White test presents a probability of Chi2=0.000. The above finding implied that there is heteroscedasticity in the residuals. The null hypothesis of constant variance cannot be supported empirically at a 5% significance level.

4.2 Robust linear regression

Based on the proposed model and the results of classical assumption testing, it could be concluded that there is a presence of heteroscedasticity. Thus, the authors performed a robust regression as shown in the following Table 4 below:

Table 4. Results of robust linear regression for PGI

Linear Regression Number of obs=501 F(4, 496)=53.38 Probability-F=0.0000 R-squared=0.2907 Root MSE=0.6254				
PGI	Robust			
	Coefficient	Std. Error	t-test	p-value
Lit_15	-0.0655	0.0196	-3.34	0.001
HH_Elt	-0.0452	0.0081	-5.54	0.000
Ln_GDRP_wO	-0.1730	0.0598	-2.89	0.004
Ln_SAF	0.1129	0.0741	1.52	0.128
Constant	12.3515	2.8897	4.28	0.000

Source: Processed data, 2022

The results of robust regression show that all estimator coefficients have met the classical assumptions, and the estimator is the best linear unbiased.

The results of this study indicated that all variables are partially significant. There was no guarantee that a high r-squared was a good econometric equation, and a low r-squared value did not always indicate a lousy equation [78]. The results of the analysis and discussion above could be summarized in the following Eq. (15):

$$\begin{aligned}PGI_i = {} & 12.371 - 0.065\, Lit15_i - 0.045\, HHElt_i \\ & - 0.17\, Ln(GDRPwO)_i \\ & + 0.113\, Ln(SAF)_i\end{aligned} \tag{15}$$

Regarding the results F-test=28.96 with a probability of 0.000, all independent variables in this econometrics model influence the PGI as the dependent variable. Table 2 displays the following coefficient parameters of -0.065, -0.045, -0.17, and 0.113. Those coefficient values are negative, meaning that three independent variables affecting the opposite direction are significant with the t-test results of -3.34, -5.54, and -2.89, respectively, and all probabilities are at a value of below 0.05. It is found that only one variable has a positive parameter coefficient of 0.113 with a t-test of 1.52 and an insignificant p-value above 5%.

For the hypothesis proposing that literacy does not affect the PGI, the Ho is not supported empirically, while H1 is (literacy affects the PGI negatively), with arithmetic coefficientof -0.065, t-test of -3.34, and p-value of 0.001. Thus, it can be concluded that the literacy has a significant effect on the level of alleviation of poverty in districts/cities in Indonesia. This finding demonstrated that increasing literacy involvement in schools would minimize the PGI. As a result, every unit increase in the literacy ratewould reduce the PGI by -0.065. This finding confirmed the success of the education program policy for the entire Republic of Indonesia under the Cabinet of the President of the Republic of Indonesia, Joko Widodo, from 2014 to the present. The increase in the population of hundreds of millions of literate people since 2014 had contributed to the decline in PGI nationally.

Furthermore, since the arithmetic coefficient is -0.045, t-testis -5.54, while p-value=0.000, the hypothesis proposing that the household electricity access does not affect the PGI, the Ho cannot be supported empirically, while H1 can (the household electricity access affects the PGI negatively). Therefore, it could be concluded that the electrical energy has significant effect on the level of poverty alleviation in

districts/cities in Indonesia. This finding revealed that the electrical energy units would lower the PGI. Thus, every unit increase in the electrical energy would decrease the PGI to -0.045. The availability of electricity in villages across the country contributed to this. It could be interpreted that every unit increase in the household receiving electricity would reduce the PGI by 0.045. Many households could access the programs for the development of the national electricity network and associated infrastructure, which provided greater literacy and community productivity services.

Furthermore, for the hypothesis proposing that GRDP with oil does not affects the PGI, the arithmetic coefficient is -0.173, t-test is -2.89, while p-value is 0.004, then the Ho cannot be supported empirically, while the H1 can (GRDP with oil affects the PGI negatively). Consequently, it could be concluded that the GRDP with oil has a significant effect on the level of poverty alleviation in districts/cities in Indonesia. This finding demonstrated that the GRDP with oil would reduce the mitigation of the PGI. Thus, every unit increase in the electrical energy would decrease the PGI to -0.045. Every percentage point rise in the GRDP with oil would decrease the PGI by 0.173. More prosperous households reduced the number of poor people and closed the gap between the poor and wealthy families. This model suggested that increasing the GRDP w ith oil had the greatest influence on lowering the PGI. Hence, the public welfare programs should be supported during the the Joko Widodo administration. Furthermore, for the hypothesis proposing that the SAF does not affect the PGI, with an arithmetic coefficient of +0.113, t-test of 1.52, while p-value of 0.128, then the Ho can be supported empirically, and the H1 cannot (the SAF affects the PGI negatively). Thus, it could be concluded that the SAF has an insignificant effect on alleviating the poverty in districts/cities in Indonesia. This finding implied that the SAF could not reduce the relief of poverty. The SAF as an independent variable should have a negative estimator to fit the theory. Nevertheless, this study proved that the optimistic estimator's value does not match the view of the theory. Although not statistically significant, the results of this study produce a positive value of 0.113, indicating that it could not lower the poverty. Thus, it was reasonable to suspect that the SAF had little or no influence or provided no benefits to the majority of the local population. In addition, the local government control over the SAF output and the quality of budget use was relatively considered poor.

Moreover, the efforts of local governments to evaluate the consistency and sustainability of SAF as a national priority in the regions were still relatively low. Another issue was the lack of support for monitoring and evaluation of the SAF. There was no specific framework that both the central and local governments could use at the same time. The higher the per capita income, the more the taxpayers could benefit from it without causing potential problems of decentralization, as was the case in low-income countries. Rodríguez-Pose and Krøijer argued that the nature and extent of devolution were shaped by political realities, ethnicity, and its effectiveness influenced by the design and capacity of institutions at all levels of government [81].

4.3 Key contributions for strategic sustainability

Based on the findings and discussion above, the authors provide the following key contributions to be considered in carrying out the sustainability of poverty alleviation programs in Indonesia:

1) Integration of education programs to improve human resource capacity building, with integration and coordination through vocational and training programs. Financial assistance and social security must be effectively managed in the programs, as well as integrated referral services and certification of expertise in many needed disciplines.
2) They are creating a distribution mechanism for electrical energy services in order to optimize community and rural productivity. Thus, continuous learning occurs, which is expected to lower the poverty.
3) Development of an adaptive GRDP with oil scheme through adaptation of socio-economic schemes, health, the creative economy, and suitable infrastructure.
4) Community income with direct cash assistance from the increase in fuel oil to people experiencing poverty can be implemented immediately, ensuring that economic performance and educational implementation continue to function well.
5) Reducing the poverty by increasing GRDP through access to productive assets, capital loans, and land use.
6) Mentoring and strengthening entrepreneurship by expanding the access to capital and markets, as well as mentoring and supporting entrepreneurship training and job opportunities.
7) Digitizing the distribution of such assistance through digital platforms (data integration). Population Identification Numbers, implementation of electronic Know Your Customer (e-KYC), and the opening of a social assistance account, as well as banking and financial technology (fintech) payment platforms can be carried out appropriately.
8) Development and guarantee of ultra-micro and micro business sustainability.
9) Reform of financing scheme regulations through the development of innovative, expansive, and sustainable financing schemes with the SAF.

5. CONCLUSIONS, LIMITATION, FURTHER RESEARCH

Based on the discussion above, the availability of education, household electricity, and oil energy through high-quality community organizations and tight budget management would boost the community's potential to get out of poverty. Good governance in this provision would optimize their productivity options with various livelihoods. This finding confirmed that the various central government policy approaches to the poverty alleviation must complement each other and be implemented simultaneously. The authors acknowledge that there is a variety of literature available on radical approaches to poverty alleviation, such as reform, economy, land, decentralization, and etc. Conversely, the results of this study conclude that to overcome multidimensional poverty, an integrated and multidimensional approach was highly required. The author emphasizes that Key Contributions for Strategic Sustainability no. 1 to 9 written above can be implemented by the government so that poverty alleviation programs can be overcome.

We believe this study has several limitations. First, the data used is cross-section thus only capturing the behavior of variables between regions. Thus, for further research to use panel data. Second, this study uses Ordinary Least Square (OLS) statistical analysis. For further research, it is necessary

to use statistical analysis using maximum likelihood estimation (MLE) or other more comprehensive methods.

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