

ANALYSIS OF FUEL OIL PRODUCTION AND FUEL PRICES ON POVERTY IN INDONESIA

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ABSTRACT

This study analyzed the effect of fuel oil (BBM) production and fuel prices on poverty in Indonesia. This study uses secondary data and quantitative methods with the type of time series data from 1993-2022 obtained from the Central Bureau of Statistics and the Ministry of Mineral Resources (MEMR). The model used in this research is the VECM model (Vector Error Correction Model) using the Eviews 10 program. The results of this research show that in the short-term fuel and fuel prices have a positive and insignificant effect on poverty. In the long term, fuel has a positive and significant effect on poverty, while fuel prices have a negative and insignificant effect on poverty.

Keywords: fuel oil, fuel Price, Poverty

Doi:

INTRODUCTION

The Ministry of Energy and Mineral Resources (MEMR) (2017) states that Indonesia has tremendous potential for renewable energy resources. Energy is a basic human need that continues to increase in line with the level of life. Energy procurement impacts the poor through increased productivity and income, and can reduce poverty on the other hand (Saghir, 2005). With energy subsidies, the lower middle class or poor can continue to enjoy abundant energy use at affordable prices and be able to carry out economic activities. Energy consumption subsidies are used to ensure that all consumers and impoverished households have access to a minimum level of energy consumption (Blum *et al.*, 2013). Energy policy decisions, such as energy subsidies or price adjustments, can affect poverty levels (Suryadi, 2015). One factor that significantly affects poverty levels is the production and price of domestic fuel oil (BBM) (Lestari, 2014).

Fuel production affects the availability of fuel for the community. In contrast, fuel prices affect the poverty rate and cost of living, including transportation and distribution of goods (Hakim, 2012). Fuel production can also affect fuel prices, so fluctuations in fuel production can have implications on fuel prices and, by extension, on poverty levels (Harahap *et al.*, 2022). An increase in fuel prices can have a negative impact on the poverty rate, as an increase in fuel prices can increase the cost of living (Fahrika *et al.*, 2020). The increase in fuel prices has an impact on increasing production costs (Sugden, 2009), (Baumeister *et al.*, 2014), (Adam *et al.*, 2016) and transportation costs. In addition, an increase in fuel prices can also affect the inflation rate, which in turn can affect the poverty rate (Sarbaini *et al.*, 2023). Various studies have shown the impact of fuel price increases on poverty in Indonesia (Sarbaini *et al.*, 2023). If the government subsidizes energy, the energy price paid by consumers will be lower than the energy price without subsidies (Khairi *et al.*, 2018). The difference between the unsubsidized energy price and the energy price paid by consumers is the amount of subsidy provided by the government (Soen *et al.*, 2022).

Previous studies focused on the Impact of Public Policy Changes in Fuel Prices on the Indonesian People's Economy (Harahap *et al.*, 2022). The Potential of Energy Subsidies in Reducing Poverty (Paramita *et al.*, 2020). Government Policy in Raising Fuel Prices and Its Impact on Society (Silbaqolbina *et al.*, 2022). This study will use a correlational data analysis approach to explain the relationship between these factors and their impact on poverty. The results of the study are expected to provide a more in-depth view of the factors that influence poverty in Indonesia and can support the formulation of more effective policies to reduce poverty.

LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

Poverty

Poverty is a condition where a person is unable to fulfill his basic needs such as food, clothing, education, and health. According to Amartya Sen (1987) in (Haughton *et al.*, 2012), poverty is associated with incompetence and deprivation which is characterized by physical incapacity, social dimensions, and material deprivation. Poverty arises when people have no income, do not receive adequate education, and have poor health conditions.

Factors That Influence Poverty

This measure of subsistence can be produced by the poverty line. According to the World Bank (Susanto *et al.*, 2021) three factors cause poverty, namely: (1) low income and assets to meet basic needs such as food, shelter, clothing, health, and education; (2) inability to speak out and lack of power in front of state institutions and society; (3) vulnerable to economic shocks related to the inability to cope with them.

Fuel Oil

Fuel oil is a type of fuel produced from refining crude oil. Crude oil from the bowels of the earth is first processed in refineries to produce oil products, which include fuel. Apart from producing fuel, crude oil refineries produce various other products ranging from gas, to products such as naphtha, light sulfur wax residue (LSWR), and asphalt. Fuel use will continue to increase in line with Indonesia's national economic growth and will decrease from time to time in accordance with Indonesia's national reserves/supplies unless new sources of reserves or the use of new renewable energy are found.

Fuel price

Subsidized fuel prices in Indonesia are the same prices regulated by the government and apply equally throughout Indonesia. Basically, the government together with the DPR determines fuel prices after taking into account the basic costs of providing fuel provided by Pertamina / other business entities as well as the level of ability (willingness to pay) of the community.

The Relationship between Fuel and Poverty

Fuel oil has a close relationship with poverty, especially in Indonesia. The increase in fuel prices can affect poverty levels and the quality of life in the community. The impact of rising fuel prices is increasing the cost of living, especially for low-income people. This can affect people's access to basic needs such as food, education, and health (Ummatin, 2010). Apart from that, rising fuel prices can also affect the inflation rate, which in turn can affect the poverty rate (Wirjodirdjo, 2010).

The Relationship between Fuel Prices and Poverty

The relationship between fuel oil prices and poverty is very close, especially in Indonesia. Rising fuel prices can affect poverty levels and people's quality of life. The Indonesian government has taken several steps to reduce the impact of rising fuel prices on poverty, such as through compensation and subsidy programs. However, the effectiveness of these programs has not been completely successful in reducing poverty rates.

RESEARCH METHODS

This study aims to analyze fuel production and fuel prices in poverty in Indonesia. In reducing dependence on fuel and its impact on poverty, the government and society need to find alternative energy sources that are more environmentally friendly and economical. One example is the use of renewable energy such as solar energy (Kuncoro *et al.*, 2016). The use of this alternative energy can help reduce dependence on fuel, reduce negative impacts on the environment, and ultimately help reduce poverty.

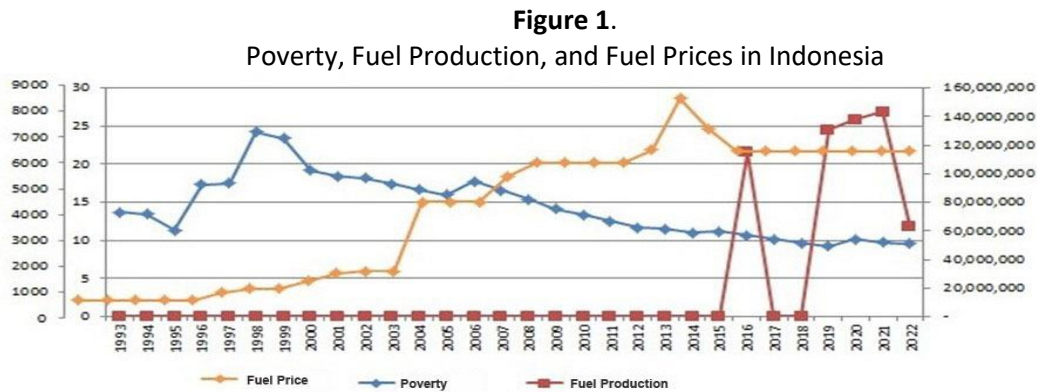


Figure 1, shows that fuel production does not follow the same trend. Fluctuations in fuel production can be influenced by factors such as production policy, world oil prices, and investment in oil exploration. In 2015, there was a significant decrease in fuel production, which resulted in an increase in fuel prices. Then the price of fuel from 1993 to 2022 with all government policies on energy policy shows that in 2014 the price of fuel soared, and this increase in fuel prices resulted in higher poverty.

This study uses secondary data in the form of annual data from 1993 to 2022 with a sample table of 30 years. Using the VECM formulation as follows:

$$\Delta y_{t-1} = \alpha e_{t-1} + \beta_1 \Delta X1_{t-1} + \beta_2 \Delta X2_{t-2} + \dots + e_{t-1}$$

Information: $e_{t-1} = y_{t-1} - (\varphi + \omega X_{t-1})$

RESULT AND DISCUSSION

This stationarity test is conducted with the unit root test to check whether the time series data is stationary. The test results are as follows:

Table 1.
 Unit Root Test Model PP

Variables	Root Unit	Prob PP	Description
Poverty (Y)	Level	0.7051	Non-stationary
	First Diff	0.0001	Stationary
FUEL (X1)	Level	0.3623	Non-stationary
	First Diff	0.0000	Stationary
Fuel Price (X2)	Level	0.5454	Non-stationary
	First Diff	0.0001	Stationary

Source: Data Processed (2023)

Based on Table 1, it can be concluded that the variables of poverty, fuel, and BB prices are stationary in the first difference.

Determining the optimum lag is important because, in the VAR model, the optimum lag of the endogenous variable is the independent variable used in the model. Determining the right optimum lag is seen by each of the smallest values of the 5 available criteria, namely the *Likelihood Ratio* (LR), *Final Prediction Error* (FPE), *Akaike Information Criterion* (AIC), *Schwarz Information Criterion* (SC), and *Hannan-Quinn Information Criterion* (HQ).

Table 2.
 Determination of Optimum Lag

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-131.6230	NA	4.299701	9.972075	10.11606	10.01489
1	-108.8278	38.83622*	1.557636	8.950210	9.526138*	9.121464*
2	-99.13311	14.36256	1.524165*	8.898749*	9.906622	9.198442

Source: Data Processing Results (2023)

Based on table 2, the five goodness criteria show the smallest value at the 1st lag, the lag value suggested by each goodness criterion is the smallest value so this study uses the 1st lag optimum to define the period of influence of each independent variable on the dependent variable.

VAR stability needs to be tested because if the VAR stability estimation results are unstable, the IRF and FEVD analysis will be invalid. The results of the VAR stability test are as follows:

Table 3.
 VAR Stability Test

Root	Modulus
0.894507	0.894507
-0.361697	0.361697
-0.218394	0.218394

Source: Data Processing Results (2023)

The results of the VAR stability test presented in Table 3 above show that the modulus value of each variable is below 1 and continues to decline. So it can be concluded that the VAR stability estimate that will be used for IRF and FEVD analysis is stable because the modulus range is <1.

Cointegration Test

Cointegration tests are conducted to determine the existence of relationships between variables, especially in the long run. The method used in testing the existence of this cointegration is the Johansen Cointegration method. The cointegration test results are exhibited in Table 4. Based on table 4, shows that in none and at most 1 trace statistics are greater than the *critical value of 5%*. At none is $60.51687 > 29.79707$, and at most 1 is $23.46181 > 15.49471$. So in this study, there is cointegration, meaning that there is a long-term relationship in the research variables.

Table 4.
 Cointegration Test
 Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.746505	60.51687	29.79707	0.0000
At most 1 *	0.560133	23.46181	15.49471	0.0026
At most 2	0.046554	1.287153	3.841466	0.2566

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level

*denote rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Source: Data Processing Results (2023)

The Granger causality test is conducted to see whether two variables have a reciprocal relationship or not. The bivariate causality test in this study uses the VAR Pairwise Granger Causality Test and uses a real level of 5%. The results of the granger causality test are as follows:

Table 5.
Granger Causality Test

Null Hypothesis:	Obs	F-Statistic	Prob.
LOGBBM does not Granger Cause Poverty	29	0.26646	0.6101
Poverty does not Granger Cause LOGBBM		3.35150	0.0786
LOGHARGA_BBM does not Granger Cause Poverty	29	7.30560	0.0119
Poverty does not Granger Cause LOGHARGA_BBM		0.93053	0.3436
LOGHARGA_BBM does not Granger Cause LOGBBM	29	2.27521	0.1435
LOGBBM does not Granger Cause LOGHARGA_BBM		0.33599	0.5671

Source: Data Processing Results (2023)

The fuel variable is statistically insignificant in affecting poverty and vice versa, the poverty variable is statistically insignificant in affecting fuel. So it can be concluded that there is no causality for the two variables of Fuel Price and Fuel.

The fuel price variable statistically significantly affects poverty, while poverty does not significantly affect the fuel price. So it can be concluded that there is no causality for the two variables. Furthermore, the fuel price variable statistically insignificantly affects fuel and vice versa the fuel variable does not significantly affect fuel prices. So it can be concluded that there is no causality between the two variables.

VECM estimation is conducted to determine the amount of influence and how significant it is from each variable to other variables. The results of the VECM estimation in the short term in this study are as follows:

Table 6.
Short-term VECM Estimation Results

Cointeq1	Coefficient	t statistics	t-table
Cointeq1	0.000764	0.02189	2,042272
Poverty (-1)	-0.064044	-0.3119	
FUEL (-1)	0.021859	0.11561	
Fuel Price (-1)	1.579804	1.02904	

Source: Data Processing Results (2023)

Based on Table 6 by connecting the short-term VECM equation formula, it is obtained as follows. The value of the lag poverty variable of -0.064 with the VECM approach obtained in the short-term poverty has a negative and insignificant effect on future poverty, this condition can also be seen from the t-statistic value smaller than the t-table, namely -0.31190 smaller than 2.042272.

The variable fuel and fuel price lag value of 0.021 and 1.579 with the VECM approach obtained in the short term has a positive and insignificant effect on future poverty. This can be proven by the value of the t-statistic is smaller than the t-table which is 0.11561 and 1.02904 smaller than 2.042272.

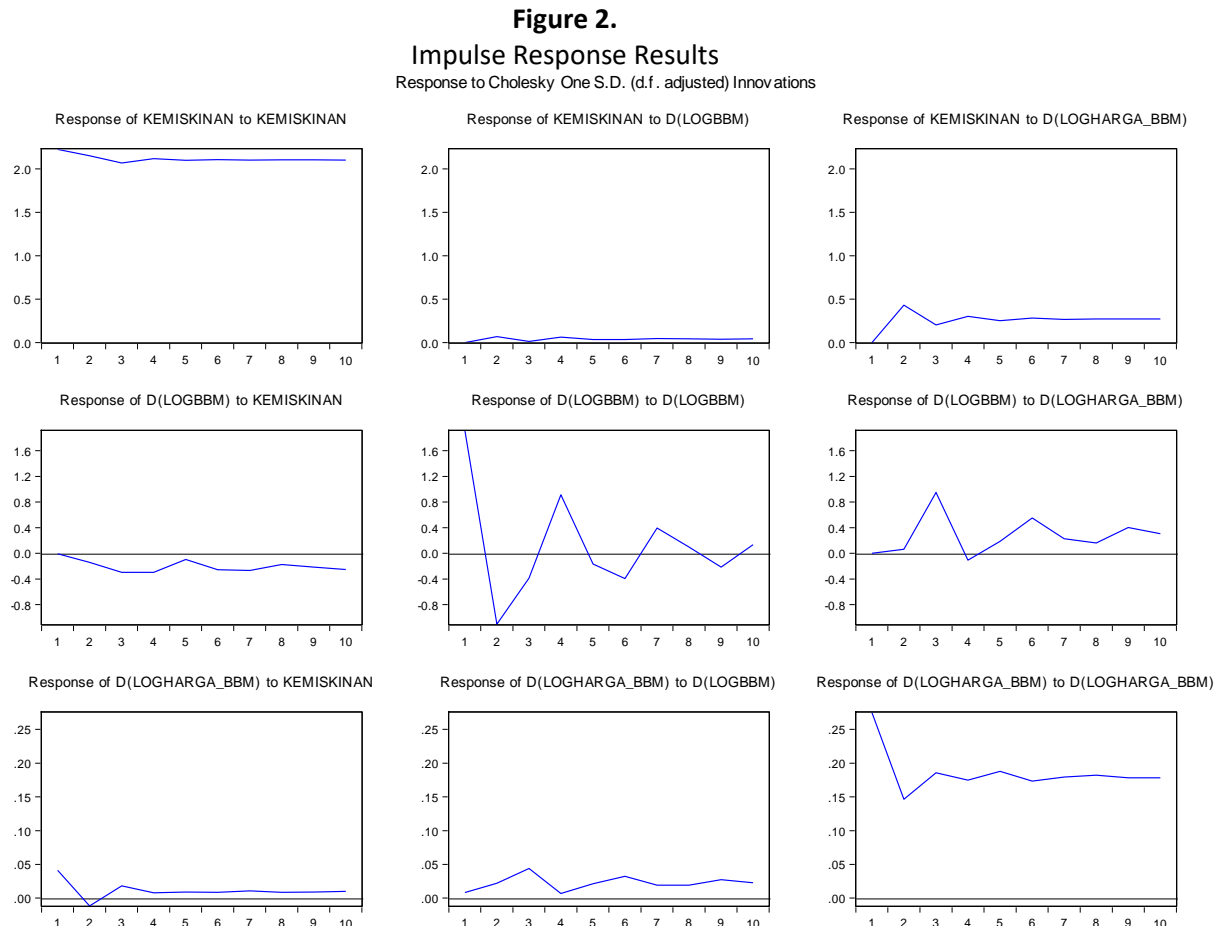
Table 7.
Long-Term VECM Estimation Results

Variables	Coefficient	t statistics	t-table
FUEL (-1)	8.929993	7.7134	2,042272
Fuel Price (-1)	-15.99218	-1.3634	

Source: Data Processing Results (2023)

Based on the formula results in the long-term VECM model, the interpretation of the results is the fuel variable has a positive and significant effect on poverty, which is 8.929993%, meaning that if there is an increase in fuel production, poverty will increase. by 8.929993%. While the price of fuel has a negative and insignificant effect on poverty, which is - 15.99218 with a t statistic value of -1.3634 smaller than 2.042272.

The impulse response results in this study are as follows:



Source: Data Processing Results (2023)

The graph in Figure 2 shows the response of fuel to the shock of poverty variable with a negative trend (-) from the beginning of the period until the end of the period. Furthermore, the response of fuel prices to poverty with a negative trend (-) in the second period began to move positively in the next period.

Variance Decomposition Result

The variance decomposition results are exhibited in Table 8. Based on Table 8, poverty has the greatest influence on poverty. This contribution fluctuates every year from the beginning of the year which is 100% to 98% in the 10th year. The fuel variable affects changes in poverty with fluctuating values, the fuel variable has the greatest dominance on poverty, namely in the second period at 46.51%, and then fluctuates in the next period until the tenth period at 38.87%. This means that when fuel production fluctuates, poverty will also fluctuate. Furthermore, the fuel price variable also affects changes in poverty with a value that fluctuates every period, meaning that when the fuel price fluctuates, it will affect poverty which fluctuates as well.

Table 8
 Results of Variance Decomposition to Poverty

Period	S.E.	POVERTY	D(LOGBBM)	D(LOGHARGA_BBM)
1	2.226902	100.0000	0.000000	0.000000
2	3.126343	98.05071	0.046510	1.902777
3	3.754952	98.36173	0.033215	1.605052
4	4.322050	98.25605	0.045688	1.698260
5	4.811020	98.31360	0.042126	1.644271
6	5.259566	98.29823	0.039662	1.662111
7	5.670170	98.30861	0.040206	1.651188
8	6.054330	98.31327	0.040155	1.646576
9	6.415108	98.31578	0.038971	1.645251
10	6.756604	98.31700	0.038878	1.644120

Source: Data Processing Results (2023)

Based on the above research using the VECM model shows that in the short term fuel production has a positive and insignificant effect on poverty. As for the long term, fuel production has a positive and significant effect on poverty in Indonesia. This study is in line with the results of previous research that changes in energy consumption such as fuel do not directly affect poverty levels, but can affect other aspects of the economy which in turn affect poverty (Pratama, 2014).

Based on the above research using the VECM model, shows that in the short term, fuel prices have a positive and insignificant effect on poverty. As for In the long run, fuel prices have a negative and insignificant effect on poverty in Indonesia. This result is consistent with previous research which states that changes in fuel prices can affect inflation rates and ultimately have an impact on poverty levels in a country (Sarbaini *et al.*, 2023).

CONCLUSION

The purpose of this study is to examine how fuel prices and the production of fuel oil (BBM) affect poverty in Indonesia. Based on the Vector Error Correction Model (VECM) model in the short term, the fuel variable has a positive and insignificant effect on poverty, and in the long term, it has a positive and significant effect on poverty. Then Fuel price variables in the short term have a positive and insignificant effect on poverty, and in the long term have a negative and insignificant effect on poverty.

REFERENCES

- Adam, P., Rianse, U., Harafah, L. M., Cahyono, E., & Rafiy, M. (2016). A model of the dynamics of the effect of world crude oil price and world rice price on Indonesia's inflation rate. *Agris On-Line Papers in Economics and Informatics*. 8(1), 3–12.
- Baumeister, C., & Kilian, L. (2014). Do oil price increases cause higher food prices? *Economic Policy Journal*. 29(80), 691–747.
- Blum, N. U., Wakeling, R. S., & Schmidt, T. S. (2013). Rural electrification through village grids—Assessing the cost competitiveness of isolated renewable energy technologies in Indonesia. *Renewable and Sustainable Energy Reviews*. 22, 482–496.
- Fahrika, A. I., & Zulkifli. (2020). PEREKONOMIAN INDONESIA SEJARAH DAN PERKEMBANGANNYA. Makassar: Yayasan Barcode.
- Hakim, A. (2012). Perbandingan Perekonomian Dari Masa Soekarno Hingga Susilo Bambang Yudhoyono (1945-2009). *Jurnal Ekonomika Bisnis*. 03 (02), 161–180. <https://doi.org/10.22219/jekobisnis.v3i2.2238>
- Harahap, G. R., & Aslami, N. (2022). Analisis Dampak Kebijakan Perubahan Publik Harga BBM terhadap

- Perekonomian Rakyat Indonesia. *JIEM: Jurnal Ilmu Komputer, Ekonomi dan Manajemen*. 2(1), 1464–1474.
- Khairi, M. W., & Aidar, N. (2018). Pengaruh Subsidi Energi Terhadap Kemiskinan di Indonesia. *Jurnal Ilmiah Mahasiswa Ekonomi Pembangunan*. 3 (3), 359–369.
- Kuncoro, A. T., & Ma'muri, M. (2016). LPG SEBAGAI ENERGI ALTERNATIF UNTUK BAHAN BAKAR DUAL-FUEL MESIN DIESEL KAPAL NELAYAN TRADISIONAL. Retrieved from <https://api.semanticscholar.org/CorpusID:116621167>
- Lestari, P. (2014). Pengaruh Belanja Pemerintah dan Indeks Pembangunan Manusia Terhadap Pertumbuhan Ekonomi di Kota Kediri. *Jurnal Pendidikan Ekonomi*, 1–16.
- Paramita, Y., Rosidah, A., & Suryanti, M. (2020). Potensi Subsidi Energi Dalam Mengurangi Kemiskinan. *Jurnal Humaniora: Jurnal Ilmu Sosial, Ekonomi dan Hukum*, 4(2), 1–10.
- Pratama, Y. C. (2014). Analisis Faktor-faktor yang Mempengaruhi Kemiskinan di Indonesia.
- Saghir, J. (2005). Energy and poverty: myths, links, and policy issues.
- Sarbaini, S., & Nazaruddin, N. (2023). Pengaruh Kenaikan BBM Terhadap Laju Inflasi di Indonesia. *Jurnal Teknologi Dan Manajemen Industri Terapan*. 2(I), 25–32.
- Silbaqolbina, Y. Z., & Najicha, F. U. (2022). Kebijakan Pemerintah Dlam Menaikkan Harga Bahan Bakar Minyak Serta Dampaknya Bagi Masyarakat. *Jurnal Fusion*, 2(06), 604–611.
- Soen, A. S., Sugianto, H., Theodorus, R., & Mapusari, S. A. (2022). Subsidi di Indonesia. *WACANA EKONOMI (Jurnal Ekonomi, Bisnis Dan Akuntansi)*. 21(1), 84–92.
- Sugden, C. (2009). Responding to high commodity prices. *Asian-Pacific Economic Literature*, 23(1), 79–105.
- Suryadi, S. (2015). Dampak Kenaikan Harga BBM dan Elastisitas Konsumsi BBM Sektor Angkutan Studi Perbandingan pada Beberapa Sektor Ekonomi. *Warta Penelitian Perhubungan*., 27 (2), 95–102.
- Wibowo, Y. E., & Windarta, J. (2022). Kondisi Gas Bumi Indonesia dan Energi Alternatif Pengganti Gas Bumi. *Jurnal Energi Baru dan Terbarukan*. 3 (1), 1–14.