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S. K. Purwanto; Sinaga, Obsatar; Morni Hayati Jaafar Sidik

Article

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Kontakt/Contact
ZBW – Leibniz-Informationszentrum Wirtschaft/Leibniz Information Centre for Economics
Düsternbrooker Weg 120
24105 Kiel (Germany)
E-Mail: *rights[at]zbw.eu*
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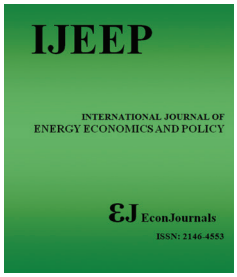

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Culprits of Increased Non-Renewable Energy Consumption in Indonesia: Role of Inflation, Poverty and Debts

S. K. Purwanto[1], Obsatar Sinaga[2], Morni Hayati Jaafar Sidik[3]*

[1]Widyatama University, Indonesia, [2]Padjadjaran University, Indonesia, [3]Universiti Kuala Lumpur, Malatysia.
*Email: mornihayati@unikl.edu.my

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ABSTRACT

Non-renewable resources, which include natural resources, are now being much rare and are being depleted in the recent decades as these are not being replenished naturally. In Indonesia, there is a need to see and manage the factors that utilize the maximum amount of non-renewable energy in the state. Thus, our study investigates the factors that characterize for the increased use of non-renewable resources that include inflation, poverty, debts, etc. This research has gathered data over 28 years of time to get a time-series analysis. The independent variables are inflation, poverty, and debts of the nation. The dependent variable is non-renewable energy consumption and the control variables are population growth and GDP of Indonesia. For this purpose, we have used Autoregressive distributed time lag (ARDL) model and Augmented Dickey Fuller (ADF) technique along with unit root tests. Further, the co-integrating among the variables is also tested for observing the relationship of variables in the long-run. The results show that all the inflation, poverty, and debts have significantly being the culprits for increased non-renewable energy consumption in both short-run and long-run analysis. However, population growth has been insignificant in the long run. The research gives useful directions for the policy-makers and people as how to reduce the increased rate of debts, inflation and poverty.

Keywords: Non-renewable Energy Consumption, Inflation, Poverty, Debts, ARDL, Indonesia
JEL Classifications: C32, E31, I32, G51, Q43

1. INTRODUCTION

"Energy" plays a crucial part in improving the socio-economic living standards of any society, and thus it's considered its imperative part (Mirza et al., 2008). With the passing time humans have used various kinds of resources to generate energy, from wood to nuclear energy, which is categorized into two different sources that are renewable and non-renewable (Tükenmez and Demireli, 2012). The main renewable energy resources are solar, hydro, wind and biomass whereas; the non-renewable energy resources include oil, gas, nuclear and coal. The former doesn't have any limit in supply and can be replenished naturally but the later one cannot be replaced or recycled (Bhat, 2018). On considering Indonesia, energy has played a key role in carrying out the economic activities of the country, satisfying consumption need as well as the production need for various departments of the economy.

Energy is indispensable in carrying out the economic activities of Indonesia, both for consumption needs and for the production activities of various sectors of the economy (Shahbaz et al., 2013; Amaya, 2020; Bibi, 2020). Hence, Indonesia is a country that is rich in energy resources whether it is renewable or non-renewable (Dargay et al., 2014). However, renewable energy resources have not been widely used but the focus was more on the non-renewable energy resources. Because of this mismanagement the presence of fossil energy, mainly fuel oil and coal is depleting slowly which has made Indonesia an importer of the crude oil and its derivative products. (Faizah and Husaeni, 2018). If in the near future, the country does not pay attention to the increase its energy resources

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or to find a new one that is replaceable the, unfortunately, in the year 2046 Indonesia is feared to be energy deficit. So, the main concern of Indonesian government right now should be to decrease the consumption of non-renewable energy resources by finding the new one (Jaelani et al., 2017). As per the report of ministry of energy and mineral resources, the crude energy reserves of Indonesia will be exhausted within 30 years, gas and coal will be depleted within 59 years and 82 years, respectively. The report proposes that due to the growing population the consumption of the energy resources from year to year is being increased shown in (Figure 1) the ratio of household debt from percentage of GDP. From 2007 to 2017 the net energy consumption had an average annual increase from 953,334,957 BOE to 1,058,262,186 BOE (Faizah and Husaeni, 2018).

Depending on the sector type, the industrial sector is considered to be the highest energy consumption, which is, then followed household, then transportation, non-energy utilization, commercial and other small sectors. On one side the energy consumption continues to increase whereas on the other side non-renewable energy resource continues to deplete and this has become a major threat to the Indonesia's economic development (Bilgen, 2014). As told that Indonesia economy would immensely suffer if there continues to be the mismanagement and imbalance of production and consumption of non-renewable energy resources, the volatile and increasing prices raises many questions, so it is the time to know the culprits that are involved in the increased utility of non-renewable energy resources (Asafu-Adjaye, 2000; Sugiyon et al., 1996). Therefore, efforts should be made to encourage the efficient utilization of energy and struggles must be made to find out the new and renewable energy resources. If the correct steps are not taken to control inflation, poverty and debt then further increase in consumption of non-renewable energy resources will be observed. No study has been conducted to know the association between increased non-renewable energy consumption and debt, poverty and inflation in Indonesia. These all observations highlighted the literature gap and are needed to be fulfilled, therefore in order to fulfill this gap we had to formulate a set of research objectives for this study,

1. To determine the effect of inflation on increased non-renewable energy consumption in Indonesia.
2. To analyze the impact of poverty on increased non-renewable energy consumption in Indonesia.
3. To determine the impact on debts on increased non-renewable energy consumption in Indonesia.

It is not possible to use the non-renewable energy resources forever as they are irreplaceable and once utilized, they cannot be regenerated or reproduced. Inflation, poverty and debt can cause the rise in the consumption of non-renewable energy resources and their effect on the consumption should be studied.

2. LITERATURE REVIEW

Undoubtedly, on considering the empirical energy economics literature, the link between consumption of the energy resources and the economic growth has been ranked the first among the studies that are commonly searched. The literature review is found in multiple sections focusing on the effects of inflation, poverty and debt on increased utility of nonrenewable energy resources.

2.1. Background

With each day passing, the demands for energy are increased immensely but the sources that are to satisfy the needs are scarce and limited and in amount. Moreover, sometimes they are also not in range (Esen and Bayrak, 2017). Furthermore, energy resources all around the world are not distribute equally, some regions have more resources and some have less. So, an unequal distribution of energy resources is observed. These factors including others force many countries to access and import these resources under reliable and sustainable conditions in order to satisfy and meet their demands (Pereira et al., 2008). Moreover, inflation, debt and poverty cause to use the non-renewable energy resources without finding the new ones or spending money to make their own new energy resources. The depletion of the resources around the world causes great competition among the other countries (Zhu and Geng, 2013).

With the changing socio-economic structures and the growing economies of the world, the energy demands of the countries are increasing day by day (Beck and Martinot, 2004). These irreplaceable resources are used immensely as a result of inflation, debt and poverty. And when these resources are used without producing the new ones then the country can become energy deficit (Esen and Bayrak, 2017). If lack of energy resources is experienced by the economy then it will either choose to accept "low economic growth through production with the existing energy resources" or it may attempt "to increase growth by meeting the uncovered part of energy demand through imports."

The high and volatile prices plus the indirect/direct procurement of energy will have a great effect on the budget balance as well as on the competitive and non-competitive environment in the national or the international markets. Hence, it can be said that they form the major indicators of the economic problems. As noted in the literature, energy has become the important issues in the world. Furthermore, limited number of countries have taken the control of the energy resources, so the problem arise that these limited countries can also threaten the security of the energy procurement, that is the reason of another problem along with the consumption cost that occurs to meet the increasing energy demands (Gielen et al., 2019). So, these issues related to energy must be sorted out by the government of that particular state who is facing such challenges by considering the role of all the factors involved that cause the consumption of non-renewable energy resources (Burke and Stephens, 2018; Love and Isenhour, 2016; Malm, 2012; Odilon et al., 2020; Osokina et al., 2020).

2.2. Inflation and Increased Non-Renewable Energy Consumption

In 1970s, an oil crisis was faced by the world since then the role of non-renewable energy production has been considered very important (Turner, 1999). Following this era, a lot of studies were conducted to increase the production of energy, labor and capital as the energy related challenges began to rise. Some studies in the past economic literature suggests that energy is a problem that

arises due to inflation in the country, they assume that if the present technologies are improved that can produce energy or if the new technologies are imported then it is possible to meet and satisfy the growing economic, Many other studies have also be conducted which states that increased energy demands raises the prices for the oil which in turn leads to the increase of the prices of many other energy resources so overall, inflation is observed ultimately, the availability of oil becomes questionable and expensive (Bor and Zhang, 2010; Datta, 2010; Tang et al., 2010). A lot of attention was given to the association between energy consumption and economic growth after the oil crisis in the late 70's and it became an important topic of the research, theoretical as well as empirical, causing debate across the globe. Some findings say that energy consumption leads to the economic growth but others states that this isn't cost-effective and use the renewable energy resources then it's a cost driver process. Hence, everyone moves towards the consumption of non-renewable energy resources. Thus, the following hypothesis can be deduced,

H1: There is a positive relationship between inflation and increased non-renewable energy consumption in Indonesia.

2.3. Poverty and Increased Non-Renewable Energy Consumption

Because of the modern, innovative and developing technologies, the tools and the raw materials that are used to produce energy now consist of high technology products that are extremely expensive and require a lot of energy to work. On one hand it do increases the production and makes life easy but on the other hand, the expensive tools and machinery is used for the production. In the developed countries or the countries that are developing fast, if there is an inefficient use of energy whether being consumed or produced in that state it will ultimately lead the country to be energy deficit and these economies become more attackable to external shocks, high price and price volatility (Cleveland et al., 2000). The growth of the economic development has very different impacts on the poverty and vice versa. Growth also reduces the poverty but it is achieved after a long time. Poverty hence, leads towards the consumption of the non-energy renewable resources. The following hypothesis thus can be interpreted from the literature,

H2: There is a positive association between poverty and increased non-renewable energy consumption in Indonesia.

2.4. Debts and Increased Non-Renewable Energy Consumption

The utility of non-renewable energy resources is increased highly when the country is in debts. The country has distorted economic growth already due to the lack of access to money to buy or invest in the imported energy resources (Usman et al., 2012). Consumers or the department that has to purchase the tools for the production of energy or to directly import from the other country suffer from disrupted capital markets and lack of collateral. Hence, the state keeps on increasing the usage of the non-renewable energy resources without finding a way to create theirs or to buy theirs. Thus,

H3: There is a positive relationship between debts and increased non-renewable energy consumption in Indonesia.

3. METHODOLOGY OF THE STUDY

3.1. Data

This research is focusing on, Inflation (IN), Non-renewable energy consumption (NREC), Debts (DE), GDP (GDP), Poverty (POV) and Population growth (PG). The researcher has collected data for this research from the data of the past 25 years extending from a time period of 1995 to 2019 from Indonesia. This time span was accurately sufficient to use the A.R.D.L approach to conduct the analysis on the time series type of data and research. The data of past 25 years was collected from the data base of World Bank.

3.2. Model Specification and Econometric Methodology

3.2.1. Model

The aim of this study is to study the relationship between NREC and IN, DE, GDP, POV and PG. According to the study of (Lin and Liu, 2016), Non-renewable energy resources can be used for a single time only and they are not beneficial for a longer period of time. Non-renewable energy consumption imposes a stress on increased production as well as population growth plays the same role as well where because of it, the consumption increases and the production needs to be increased as well but because of the uneven inflation rate and changing value of money stability is hard to achieve which gives rise to debts and poverty. In view of the above-mentioned variables and their relationships and impact on each other, (Wang and Prominski, 2015) proposed a model to study these which is given below:

$$NREC_t = \beta_0 + \beta_1 IN_t + \beta_2 DE_t + \beta_3 GDP_t + \beta_4 POV_t + \beta_5 PG_t + \varepsilon_t \quad (1)$$

In the equation above, β_0 is the constant term, $NREC_t$ represents non-renewable energy consumption, IN_t representing the inflation, DE_t represents the debts, GDP_t represents the gross domestic production, POV_t represents the poverty, PG_t represents the population growth and at last $\varepsilon_{t\ is}$ the measure of error. For the reduction of the potential heteroscedasticity, all of the variables present in the equation 1 are to be converted in the natural logarithms. For a conversion to the per capita form from the series form, series have been divided using population series. The converted logarithm form of the model is given as:

$$\ln NREC_t = \beta_0 + \beta_1 \ln IN_t + \beta_2 \ln DE_t + \beta_3 \ln GDP_t + \beta_4 \ln POV_t + \beta_5 \ln PG_t + \varepsilon_t \quad (2)$$

In the above equation 2, β_0 is a constant factor, β_i (in which i = 1, 2, 3, 4, 5) are the values of elasticity for the IN, DE, PG, POV and GDP in the long term. The equation 1 was converted to equation 2 in order to monitor the long term relationships that could possibly exist between $\ln NREC_t$ (Natural log of non-renewable energy consumption) and $\ln IN_t$ (Natural log of the Inflation), $\ln POV_t$ (Natural log of poverty), $\ln PG_t$ (Natural log of the population growth), $\ln DE_t$ (Natural log of debt), $\ln GDP_t$ (Natural log of GDP). The expected signs for β_1, β_2, β_3, β_4 and β_5 are positive.

3.2.2. Estimation model

3.2.2.1. Unit root

For the analysis of the stationarity of the present data the unit root test will be used, this test is also used in order to check that whether or not the presented model is feasible for the study under conduct. Another difficulty is to select the right test for the model as well. In the study under conduct, "Augmented Dickey Fuller test (1981), Philips-Perron (P.P.) test (1988), Kwiatkowski Philips-Schmidt-Shin (K.P.S.S.) unit root test" are used, which will make sure of the integration of the series and will also provide confirmation for the presence of the unit roots in the variables selected.

3.2.2.2. Bounds test of co-integration

The study implements the "Pesaran et al. (2001) A.R.D.L. bounds test" on the series which has been confirmed of its integration, this application is now done for confirmation of co-integration. This test of co-integration is flexible as compared to other ones. The ARDL model is used in order to study long-term relationships of the variables and it is done so by an optimal lag length. The identification of dependent and independent variables can be done in ARDL model "Wald test of joint significance or F-test" is used determine long term relationships in equation 3:

$$\begin{aligned}\Delta \ln \mathrm{NREC}_t &= \beta + \sum_{i=0}^{P} \beta i \Delta \ln \mathrm{IN}_{t-i} + \sum_{j=0}^{q} \beta j \Delta \ln \mathrm{DE}_{t-j} \\ &+ \sum_{k=0}^{r} \beta k \Delta \ln \mathrm{GDP}_{t-k} \sum_{l=0}^{S} \beta l \Delta \ln \mathrm{POV}_{t-l} \\ &+ \sum_{m=0}^{t} \beta m \Delta \ln \mathrm{PG}_{t-1} + \lambda_{\mathrm{NREC}} \ln \mathrm{NREC}_{t-1} \\ &+ \lambda_{\mathrm{IN}} \ln \mathrm{IN}_{t-1} + \lambda_{\mathrm{DE}} \ln \mathrm{DE}_{t-1} + + \lambda_{\mathrm{GDP}} \ln \mathrm{GDP}_{t-1} \\ &+ \lambda_{\mathrm{POV}} \ln \mathrm{POV}_{t-1} + \lambda_{\mathrm{PG}} \ln \mathrm{PG}_{t-1} + \nu_t \end{aligned} \quad (3)$$

Here, the error factor is represented by υ_t, Δ is there to represent the short term, as Wald test is also used for more than 1 variables in the short term, co-efficient of all of the differenced variables in short term are equal to 0. There are 2 bounds, the upper and lower one, if value of estimated F-statistic is more than upper bound null hypothesis is rejected and it is not rejected if it is beneath that value. After this estimation of co-integration, the estimation of long term and short-term elasticity can be studied as under in equation 4 and 5:

$$\begin{aligned}\ln \mathrm{NREC}_t &= \alpha + \sum_{i=1}^{P} \phi \mathrm{l}_i \ln \mathrm{NREC}_{t-i} + \sum_{j=1}^{q} \omega \mathrm{l}_j \ln \mathrm{IN}_{t-j} \\ &+ \sum_{k=1}^{r} \varphi \mathrm{l}_k \ln \mathrm{DE}_{t-k} \sum_{l=1}^{S} \partial \mathrm{l}_l \ln \mathrm{GDp}_{t-l} \\ &+ \sum_{m=1}^{t} \eth \mathrm{l}_m \ln \mathrm{POV}_{t-m} + \sum_{n=1}^{u} \gamma \mathrm{l}_k \ln \mathrm{PG}_{t-n} + \mu_t \end{aligned} \quad (4)$$

$$\begin{aligned}\ln \mathrm{NREC}_t &= \gamma_0 + \sum_{i=1}^{P} \gamma \mathrm{l}_i \ln \mathrm{NREC}_{t-i} + \sum_{j=1}^{q} \gamma \mathrm{l}_j \ln \mathrm{IN}_{t-j} \\ &+ \sum_{k=1}^{r} \gamma \mathrm{l}_k \ln \mathrm{DE}_{t-k} \sum_{l=1}^{S} \gamma \mathrm{l}_l \ln \mathrm{GDp}_{t-l} \\ &+ \sum_{m=1}^{t} \gamma \mathrm{l}_m \ln \mathrm{POV}_{t-m} + \sum_{n=1}^{u} \gamma \mathrm{l}_k \ln \mathrm{PG}_{t-n} + \mu_t \end{aligned} \quad (5)$$

In equation 5, the ECT_{t-1} is the error correction term, moreover, it must be negative and value of coefficient should be between 0 and 1. From the 2 equations above long term and short-term elasticity can be studied.

3.3. Model Stability and Diagnostic Tests

The diagnostic tests are used to identify heteroscedasticity, residual serial correlation and correlogram of residuals. Test of cumulative sum C.U.S.U.M is used for stability test of coefficients for the long-term. In this, Granger causality test is used for testing the causality direction for the estimated variables. After confirmation of long-term relation through equation 2, the error correlation model is developed as in equation 6 below:

$$\begin{bmatrix}\Delta lnNREC\\ \Delta lnIN\\ \Delta lnDE\\ \Delta lnGDP\\ \Delta lnPOV\\ \Delta lnPG\end{bmatrix} = \begin{bmatrix}a1\\ a2\\ a3\\ a4\\ a5\\ a6\end{bmatrix} + \begin{bmatrix}S11,1 & S12,1 & S13,1 & S14,1\\ S21,1 & S22,1 & S23,1 & S24,1\\ S31,1 & S32,1 & S33,1 & S34,1\\ S41,1 & S42,1 & S43,1 & S44,1\\ S51,1 & S52,1 & S53,1 & S54,1\\ S61,1 & S62,1 & S63,1 & S64,1\end{bmatrix}$$
$$+ \begin{bmatrix}\Delta lnNRECt-1\\ \Delta lnINt-1\\ \Delta lnDEt-1\\ \Delta lnGDPt-1\\ \Delta lnPOVt-1\\ \Delta lnPGt-1\end{bmatrix} + \begin{bmatrix}S11,1 & S12,1 & S13,1 & S14,1\\ S21,1 & S22,1 & S23,1 & S24,1\\ S31,1 & S32,1 & S33,1 & S34,1\\ S41,1 & S42,1 & S43,1 & S44,1\\ S51,1 & S52,1 & S53,1 & S54,1\\ S61,1 & S62,1 & S63,1 & S64,1\end{bmatrix}$$
$$\times \begin{bmatrix}\Delta lnNRECt-m\\ \Delta lnINt-m\\ \Delta lnDEt-m\\ \Delta lnGDPt-m\\ \Delta lnPOVt-m\\ \Delta lnPGt-m\end{bmatrix} + \begin{bmatrix}\varphi 1\\ \varphi 2\\ \varphi 3\\ \varphi 4\\ \varphi 5\\ \varphi 6\end{bmatrix} \times \left(\mathrm{ECT}_{t-1}\right) + \begin{bmatrix}\eta 1t\\ \eta 2t\\ \eta 3t\\ \eta 4t\\ \eta 5t\\ \eta 6t\end{bmatrix} \quad (6)$$

In equation 6 Δ represents first difference operator and ECT_{t-1} represents the lagged error correction term which must be between 0 and 1 with a negative sign. Equation 2 gives a confirmation of short-term relationship and VECM model confirms long term relationship among variables. F-statistic will be used for knowing about weak or short-term Granger causality.

4. EMPIRICAL RESULTS DISCUSSION

4.1. ADF and Unit Root Test Results

The Augmented Dicky Fuller (ADF) is used to test for the stationarity of the variables so that the variance and mean of the variables remain fixed and content over the time. Stationarity defines the way of modeling for the dependence structure. The level differences of all the constructs have also been noted. For unit root test, we have first taken intercept at the level state and then at the 1st difference level. The results of Table 1 indicate both the ADF and LLC unit root tests consequences.

First the ADF test results at level state that inflation, debts, population growth, and non-renewable energy consumption have been significant at 1% significance level by rejecting the null hypothesis of non-stationarity. Hence, we conclude that the inflation, debts, non-renewable energy consumption, and population growth have been stationary over the time at level. The GDP and poverty have been non-stationary shown in Table 1. Though, at the first differences, all the constructs had been found to be stationary over time.

The LLC unit test at level state indicate that inflation, debts, population growth, and non-renewable energy consumption has been significant at 1% level, hence we reject the null hypothesis of non-stationarity and we conclude that the inflation, debts, non-renewable energy consumption, and population growth have been stationary over the time at level. The GDP and poverty have been non-stationary. Though, at the first differences, all the constructs had been found to be stationary over time. This test is basically a prerequisite for checking the co-integration among the variables.

4.2. ADF and LLC Unit Root

Table 1: ADF and LLC Unit Root Test Results

Constructs	ADF Test		LLC Test	
	Level	1st diff.	Level	1st diff.
IN	1.134*	5.384**	–3.294*	–7.976**
POV	2.495	5.284**	–0.397	–6.365***
DE	9.483*	8.284**	–6.917*	–9.976***
PG	7.495*	5.295***	–8.237*	–9.976***
GDP	3.384	9.295***	–4.371	–7.787***
NREC	6.384*	7.204***	–8.361*	–9.866***

4.3. Co-integration Test Results

Next step is to see for the co-integration effects among the variables. For this we calculate the F-statistic bound test along with the upper and lower critical bound values of the O.P.L. length analysis. The F-statistic value is highly significant here at 10% level indicating that there is co-integration among the variables of the study over time. Therefore, we conclude that there is integration among the variables in the long-run of the analysis and hence poverty, inflation and debts are considered to be effective of the increased non-renewable energy consumption. The Table 2 shows lower bound critical value and the upper bound critical value lie in accordance with the significance of F-statistic at 1%, 5% and 10% levels of significance. The optimum lag length selected for this analysis is also shown in the first row of table below.

4.4. Co-integration Test

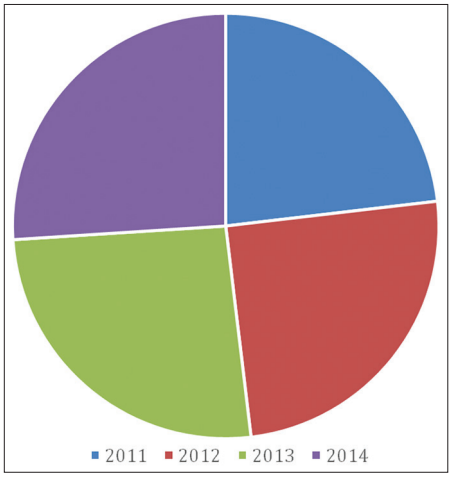
Table 2: Co-integration Test Results

O.P.L. length (A.I.C)		(2,0,0,0,0,0)	
F-Stat. (Bound Test)		14.348***	
V.C	1%	5%	10%
L.B.C.V.	2.68	2.15	1.93
U.B.C.V.	3.79	3.04	2.91

4.5. ARDL Estimation Results

The last analysis is to see the ARDL estimated results as how much the variables have affected the dependent one over the years. The results for A.R.D.L. show the effect of coefficients in the long run and short run analysis.

Figure 1: Household debt to GDP in % age, Indonesia



The results of the Table 3 show long run analysis and short run analysis estimations. In the long run, inflation, poverty, debts, and GDP have significantly affected the non-renewable energy consumption. A unit increase in inflation will cause an increase of 35% on non-renewable energy consumption. Poverty has 37% impact in increasing the non-renewable energy consumption. The role of debts is also significant and amounts for 28% increase in the non-renewable energy consumption. Similarly, GDP also effects the non-renewable energy consumption. However, population growth has not been significant in impacting an increase in non-renewable energy consumption in the long run. The adjusted R^2 value amounts for the overall effect of independent variables on the dependent variable which is non-renewable energy consumption. According to results, all the independent variables have a combined effect of 75 % on non-renewable energy consumption.

In the short run analysis, all the variables have been significantly impacting the non-renewable energy consumption. Poverty has the highest impact of 37% on increasing the non-renewable energy consumption. Similarly, inflation and debts also account towards the non-renewable energy consumption. The adjusted R^2 value amounts for the overall effect of independent variables on the dependent variable which is non-renewable energy consumption. According to results, all the independent variables have a combined effect of 67 % on non-renewable energy consumption. Therefore, the results show that when inflation increases, the debts increase and the rate of poverty increases, the use for non-renewable energy resources also increase as people are not able to afford for the renewable energy resources.

5. DISCUSSION AND CONCLUSION

5.1. Discussion

The main purpose of this research was to examine the impact of inflation, poverty, and debts increased consumption of non-renewable energy. The consumption of non-renewable energy has been increased in Indonesia due to which poverty and debts have

Table 3: ARDL Estimation Results

Long run results	B	t-value	Summary and diagnostic test	
NREC	4.164***	-	R^2	0.764
NREC (-1)	3.364**	-	Adj. R^2	0.756
NREC (-2)	3.789***	-	*D.W.*	2.10
IN	0.352	3.575***	X^2SC	0.576 (0.998)
POV	0.242	3.747**	X^2W	2.986 (0.566)
DE	0.253	2.875***	X^2AR	0.865 (0.154)
PG	0.074	1.246		
GDP	0.244	2.897*		
C	2.985	3.854**		
Short run results	**B**	**t-value**	**Summary and diagnostic test**	
IN	0.275	3.754***	R^2	0.694
POV	0.268	3.854**	Adj. R^2	0.676
DE	0.215	2.678***	X^2SC	0.876 (0.133)
PG	0.164	2.865**	X^2W	3.688 (0.438)
GDP	0.253	2.564**	X^2AR	2.987 (0.123)

become the main culprits to energy consumption and creating disruptions in the economy (Wang and Prominski, 2015). For example, carbon emissions have been increased, and their relation to energy consumption that has a huge impact on global warming. The rise in GDP, such as debt increases the demand for energy in the country. Such type of demand is fulfilled by the country with the help of non-renewable and renewable energy due to which the consumption of both energies has been increased. The short-run in the GDP of the country indicates that the consumption of non-renewable energy has been increased by the variation of about 90% (Lin and Liu, 2016). Indonesia is now trying to switch towards renewable energy such as nuclear plants etc. The results and findings of this research indicated that inflation also has a huge impact on the increase of the non-renewable energy of Indonesia. Inflation in Indonesia has increased the needs of energy, especially in the urban areas, as the economy is at full employment. Indonesia has now focused on crude oil as non-renewable energy due to inflation, which is an unsustainable policy because the government needs to raise these prices (Kahia et al., 2019). The prices of fuel and electricity increase due to inflation, which results in an increase in non-renewable energy. Previous researchers believe that there is a strong relationship between energy consumption in the international market and Indonesia prices regulation.

The results of the research also showed the impact of poverty on the consumption of non-renewable energy in Indonesia. Poverty acts like a time bomb in the country when it comes to the increase in consumption of energy (Fan and Nam, 2018). Most of the people living in urban areas turn to non-renewable energy, such as coal when poverty rises. Indonesia has a large number of populations which is clustered above the poverty line. The rise in inflation and poverty in the country can push this population below that line. Due to poverty, poor people are least likely to have electric power and try to consume non-renewable energy. The results and findings of this study overall indicated that inflation, poverty, and debt are considered as the main culprit of the consumption of non-renewable energy in Indonesia, which is a serious concern (Alfata, 2018).

5.2. Implications

Non-renewable energy is being consumed due to high inflation, debt, and poverty in Indonesia. The results and tables explained that it could affect the energy consumption process in the country and eliminate the resources of non-renewable energy in the country.

5.3. Conclusion

The significant purpose of this study is to examine the culprits of Increased Non-Renewable Energy Consumption in Indonesia through the role of Inflation, Poverty, and Debt. On the basis of the above analysis, it has been concluded that the inflation rate, debts, and poverty are known as the main culprits of increased non-renewable energy in Indonesia. The primary purpose of the research paper is to understand the impact of these three independent variables on the single dependent variable that is the consumption of non-renewable energy. The time series analysis has been conducted in this study. Furthermore, the ARDL estimation approach has also been implied in the research. The results significantly indicate that there are a significant impact and role of the debt, poverty and other factors.

5.4. Limitations

The empirical study provides different new information regarding the relationship between inflation rate, debt and poverty, and its connection with the non-renewable energy. However, the study has a few limitations that are necessary to illustrate. This research is mainly focused on the consumption of non-renewable energy only; however, renewable energy is also being consumed to a great extent. The future researchers can focus on the other variables in the study such as the impact of inflation, poverty, and debt on renewable energy consumption.

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