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Energy Consumption, Carbon dioxide and Economic Growth Nexus in Indonesia

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ABSTRACT

This research study demonstrates the relationship between carbon dioxide emission, energy consumption and economic development in Indonesia. The annual data has been taken for the period of 1970 to 2018. Several tests have been applied to conduct this study such as structural break test, stationary test, Toda-Yamamoto test, Johansen and Juselius method and Variance decomposition test. According to the results of causality test, there is single side causality running from economic development to energy consumption. Results, therefore, support conservation hypothesis for Indonesia. The outcome of variance decomposition indicates that energy consumption affects the economic development in short run. The empirical output also reveals fluctuations in per capita income that highlight the need of an effective public policy. The study also recommends various energy conservation policies for economic development.

Keywords: Economic growth, carbon dioxide gas emission, energy consumption, time sequences

1- Introduction

This research paper has been carried out for Indonesia for the period 1970 to 2018. This paper aims to evaluate the relationship among emission of carbon dioxide gas, economic growth and energy consumption. Indonesia is one of the fast-growing economies of the ASEA. There is a general rise in energy consumption with harmful impacts on the environment of this state because of economic growth. In past recent decades of Indonesia, the economy in terms of energy has been influenced. The conditions that have to go through from alternation like the economy of agriculture constitute on fuels and it has to undergo from the utilization of some renewable energies and biomass. In Indonesia, there is a wide range of resources like natural gas, crude oil, power of hydroelectricity and coil. Indonesian state has no compulsion to import these resources. In prior years, there is a rise in demand for imports and energy due to rise in income per capita. Some organizations have taken ownership of the energy sectors and in the domestic market as well, it will decide the prices in terms of sales of energy itself. It will take charge of around less than fifteen per cent.

For Indonesia, in case of a supply of gas and oil out of some organizations 'The Indonesia National Oil and Gas Groups' also called Petro Indonesia will play a role of the monopolist. Ninety-five per cent of mined coal will be offered to the organization of Indonesia National Coal Mineral Industries Group also called Vinacomin. The electricity market is under control of 'The Indonesia Electricity Power Group' also called EVN that out of total production of electricity bring in 2/3 part. EVN has control over sixty per cent of total electricity production and it covers greater than three-quarters of market electricity. And hence the venture of state-owned dominates the whole market of energy. There is a total of one hundred and thirteen power plants that are working in Indonesia. The organizations that show whole hydroelectric power is about 37.6% that generate 15.8 GW, the organizations that show 34.3% and generate 14.4 GW which use coal and

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which are generating 7.5 GW power from 17.8% gas utilization. Other energies and oils that are renewable have a percentage in the total of 3.3% and 5.8% respectively.

Use of energy has gradually increased in the past years. In Indonesia, during 2005-2017 the primary level of consumption of energy has increased greater than a proportional rise. There are about 75.3 million tons of primary level energy oil equivalents that are utilized in Indonesia. The consumption of energy rather increases and it represents an influence in its pattern of consumption. The large amount of energy consumed is through industrial sectors which is equivalent to 43% of consumption, areas of residence consumed about 29.6% and transportation sector is equal to 22.7%. All such kinds of the rise in utilization of energy cause an increase in the rate of emission of carbon dioxide gas.

During 1997 to 2016 there is a significant rise in carbon dioxide gas emission that is equivalent to 206,042.1 Kt. In this regard, Indonesia reported an annual rise of carbon dioxide gas emission from 43,373.4 to 206,042.1 Kt that is about 18% more. The amount of carbon dioxide gas emissions fall to 0.09% in the last quarter. In 2016 the emission of carbon dioxide is 0.37 kg per 1000 dollar GDP and rising annually from 1997 to 2016 at a rate equal to 2.24%. At this stage of introduction of this paper represents that the aggregate level of income, energy consumption and emission of carbon dioxide gas are the basic pillars to assess and sustain the economic growth in Indonesia. In this paper, it also needs to assess either the theory of EKC established or not.

Table 1. Indonesia's 2014 market participation in energy production

Possession	Power (Mega Watt)	Charge (per cent)
Indonesia Electricity Power Group	20539.7	60
Indonesia National Oil and Gas Group (Petro Indonesia)	4429.0	13
Indonesia National Coal Mineral Industries Group (Vinacomin)	1485.0	4
Local investors	4765.6	14
Foreign investors	2859.5	8

2- LITERATURE REVIEW

There are several types of researches and studies related to the consumption of energy and economic development in the viewpoint of Lacheheb, Rahim et al. (2015). There was a causal relationship between economic growth and consumption of energy that include some instructions and orders like (1) 'Impartiality in hypothesis' in case of no casual relationship of GDP and consumption of energy, (2) 'Conservation hypothesis', in case of a one-sided causal relationship between energy consumption and GDP, (3) 'Growth hypothesis', in case of a causal relationship between energy consumption and economic development and (4) 'Feedback hypothesis' Instead of a bidirectional causal relationship between economic development and energy consumption.

In 1995 and empirical study has been done under Environmental Curve Theory which has discussed the challenges and issues with the relationship among emission of carbon dioxide gas, GDP and energy consumption (Hundie 2018). The presence of a relationship of the quality environment with income per capita will be represented graphically in a bell shape. In the initial stage, there was a reduction in the quality environment as well as with the increase of wealth and then a trend of rising in pollution start with a high level of income. In other words, it can say that with higher income there will be a higher emission of pollution. And afterwards, it was observed a clear deterioration in the emission of pollution with a rise in income (Dong, Sun et al. 2018). It brought out due to structural influence that makes different phases of growth and shows fluctuations. Greater the demand of quality environment, greater will be the production of more clean goods. In 1992, the World Development Report was established for first literature on the Environmental Kuznets Curve (EKC). This study represented some consequences and findings that show some variables destroys environment with a rise in income like as urban solid waste and emission of carbon dioxide gas and some indicators destruct environment less with an increase in income like pollution of water and some represent upturned U structured patterns like nitrous oxide and sulfur oxide (Wang, Li et al. 2018). There could be different pattern and trends in terms of income and environment relationship. Monotone and non-monotone two categories of relationships can be differentiated at an extent. According to monotone relationship pollution will be grown continuously like as services of water supply, reducing income and urban solid waste. And in the case of non-monotone relationship, upturned trends could be seen in it. As prior it was stated at initial stage environment would get adversely affected with a rise in income and then after a phase, it would lead

to reducing when it touch the situation where an increase in income brings out quality environment (Zaman and Abd-el Moemen 2017). And then a final phase came with an inverted structure also called N relationship where this mechanism would disconnect with each other. It is also possible for the appearance of even more complicated categories of graphical demonstration even if the empirical study is in favour of trend and showing the existence of EKC (Mirza and Kanwal 2017).

The relationship between consumption of energy, carbon dioxide gas emission and economic growth is not so old and discussed in recent studies as well with more problems and issues. The researches have been done and emphasized to verify the inversed U structured test for validation. Farhani and Rejeb (2012)explored the relationship among one hundred and thirty countries in a panel in terms of carbon dioxide gas emission per capita and GDP per capita from 1951 to 1986. Haseeb, Abidin et al. (2019)have to build a model with dynamic nature and studied EKC considering energy consumption, GDP level, influences in technology and intensity in structure as variables of the model. The data were explored from 1960 to 1993 with time-series sequence in nature of Britain, West Germany, the United States and the Netherlands. And the finding made a confirmation that there is a positive relationship between carbon dioxide gas emissions and economic growth. Apergis and Danuletiu (2014)analyzed an index for environmental efficiency from 1975-1990, by using cross-section data in units of per capita. And here they supposed to take fifty-two states where there would be the verification of U-structure for such states that have GDP per capita greater than five thousand dollars.

Binh (2011)conducted a study for the relationship between carbon dioxide gas emission and GDP and took time-series data from 1960-1996. The set of data was used for one hundred states that showed the verification of the correlation between economic growth and carbon dioxide gas emission. Adom (2011)studied the relationship from 1970-2000 between carbon dioxide gas emission and GDP and theory of EKC using time series analysis for Canada and findings have shown no confirmation of the theory of economics. Okyay, Aricioglu et al. (2014)examined the relationship within carbon dioxide gas emission and economic growth in United State America from 1960-2004. Conclusions have shown a positive association among variables. Shahbaz, Dube et al. (2015)studied twenty-two OECD states from 1960-2001 and the study verified the association among indicated variables such as economic development, consumption of energy and social capital. All the variables taken in this research were correlated with each other according to results. Nnaji, Chukwu et al. (2013)conducted a study for the relationship within coal intensity and economic growth of twenty-five OECD states with time period of 1980-2005. Results confirmed the existence of bidirectional casual relationship among all variables used in the study. Abidin, Haseeb et al. (2015)conduct another study for South Africa by using time series data with the period from 1965 to 2006. By stereotype of the co-integration method, it has been confirmed single way causal relationship within emission of carbon dioxide gas with economic development and energy intensity with the emission of carbon dioxide gas and energy intensity with economic growth. In Canada, Abid and Sebri (2012)analyzed the emission of carbon dioxide gas which has a concern with the theory of EKC model that use time-series data from the period within 1948-2004 and make it a fact that there was no indication for the existence of theoretical or empirical demonstration. Leitão (2014)conducted a study that indicates the casual relationship among emission of carbon dioxide gas, consumption of energy and economic growth taking period from 1995-2007 in China. The results have shown a two-sided causal link between economic growth and energy utilization.

Eddrief-Cherfi and Kourbali (2012)determined the indicators of emission of carbon dioxide gas for about sixty-nine states with period taken from 1985 to 2005. The study determined the correlation with foreign trade, energy consumption and GDP with the conclusion that economic development and foreign trade will bring out a raise emission of carbon dioxide. Dritsaki and Dritsaki (2014)studied a model by using an ARDL approach for the relationship in China and India among energy utilization, foreign trade, carbon dioxide gas emission and income growth taking a period of 1971 to 2007. The findings have shown that there was a positive relationship among variables in this research paper. Shahbaz and LeitÃ (2013)studied the case of Nigeria by using time series data from 1970 to 2008. The study particularly determined the circumstances in the long-run association among economic growth, carbon dioxide gas emission and consumption of energy. There was a direct relationship between carbon dioxide gas emission and economic growth. Dogan (2014)analyzed the relationship between carbon dioxide gas emission, consumption of energy and economic development by taking data from 1995 to 2009 in China. The conclusion demonstrates of this study that rise in economic growth will because of the emission of carbon dioxide gas. Khobai and Le Roux (2017) explored the connection within economical growth, energy consumption and emission of carbon dioxide gas in developed states. The period that was taken from 1975 to 2010 which will make a rise in consumption of energy bring out more carbon

dioxide gas emission. Saatci and Dumrul (2013)study had decayed carbon dioxide gas emission in China with intensiveness of carbon dioxide gas emission relating to economic growth. The data had taken from 1996 to 2006 and found that the reason for more emission of carbon dioxide gas was economic growth. According to Magazzino (2014), the link between economic development and carbon dioxide gas emission was analyzed by taking data from 1994 to 2012 with the usage of decoupling index. The conclusion has shown that there was a correlation between carbon dioxide gas emission and economic growth. Rezitis and Ahammad (2015)studied regionally in china and the study has shown verification for regional differentiation in the emission of carbon dioxide gas from 1996 to 2006 and it concluded that rise and fall in emission of carbon dioxide gas caused by different activities of government for development in different regions and areas.

There were several studies conducted in Indonesia that determined the correlation among variables or indicators of the research. According to Lau, Chye et al. (2011)examined the link from 1980 to 2010 among Foreign Direct Investment, energy consumption, economic growth and emission of carbon dioxide gas. The findings had shown that there is no existence of EKC theory in the case of Indonesia. It has depicted that there was a positive relationship among variables for this research that is focused on the analysis of the co-integration approach. According to Solarin (2011)analyzed the issues of relationship within economic growth and emission of carbon dioxide gas relating to other opinions. It had been studied in Indonesia the social development influence energy consumption and intensity of emission of carbon dioxide gas by taking panel data from 2010 to 2013. It has depicted that social development caused by more economic growth which makes a rise in consumption of energy in low-income states and hence also leads to rises emission of carbon dioxide. Shahateet (2014)examined the relationship in Indonesia by taking data from 2010 to 2019 among consumption of energy that can be renewed, economic growth and emission of carbon dioxide gas. According to a study of the forecast, it was stated that 3% of the emission of carbon dioxide gas will rise by 5% increase in GDP. Table 2 is indicating consumption of energy, carbon dioxide gas emission and GDP.

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Table-2

Authors	Nations	Time series	Consequences
Farhani and Rejeb (2012)	130 countries	1951 to 1986	Highlighted the existence of inversed U structure.
Haseeb, Abidin et al. (2019)	4 countries	1960 to 1993	Outcomes prove a positive link between economical progress and emission.
Apergis and Danuletiu (2014)	52 countries	1975 to 1990	U shape is certain for the nations that have GDP per capita above 5000 dollars.
Adom (2011)	Canada	1970 to 2000	Outcomes don't sure for the economic theory.
Adom (2011)	100 countries	1960 to 1996	Interlinked between CO_2 and economical growths.
Okyay, Aricioglu et al. (2014)	USA	1960 to 2004	Consequences showed a positive interlink among variables.
Shahbaz, Dube et al. (2015)	22 OECD countries	1960 to 2001	All the variables are correlated.
Nnaji, Chukwu et al. (2013)	25 OECD countries	1980 to 2005	Existence of bidirectional causality in the connection among all the variables.
Abidin, Haseeb et al. (2015)	South Africa	1965 to 2006	Proved single side causality in the relationship between $CO_2$and economic progress, energy usage and CO_2gas emissions and consumption of energy and economic development.
Leitão (2014) and and Sebri (2012)	Canada	1948 to 2004	No assurance of proofs whether theoretically or empirically in terms of EKC theory.
Leitão (2014)	China	1995 to 2007	A strong two side causal relationship among CO_2, energy consumption and economic development.
Eddrief-Cherfi and Kourbali (2012)	69 countries	1985 to 2005	Economic growth and foreign trade cause a rise in CO_2 gas emissions.
Dritsaki and Dritsaki (2014)	China and India	1970 to 2008	A direct relationship betweenCO_2 and economic growth.
Shahbaz and LeitÃ (2013)	Nigeria	1995 to 2009	Outcomes of this research get thatCO_2emissions rises with the quick development of the Nigerian economy.
Dogan (2014)	China	1975 to 2010	There is a rise in power consumption produce a rise in CO_2.
Khobai and Le Roux (2017)	Developed states	1980 to 2010	Outcomes showed EKC' theory is not in favour of Indonesia.
Saatci and Dumrul (2013)	China	1976 to 2009	The two-way link between $CO_2$and economic growths.
Magazzino (2014)	EU	1994 to 2012	Two-way link relationship between $CO_2$and economic growths.
Rezitis and Ahammad (2015)	China	1996 to 2006	The cause of CO_2 emissions in China was economic growth. This study illustrates that government strategy for inter-regional emissions is in variety. Here outcome has shown that CO_2emissions are interlinked with economic growth, special in case of family.
Lau, Chye et al. (2011)	Indonesia	1980 to 2010	The findings had shown that there is no existence of EKC theory in the case of Indonesia. It has depicted that there was a positive relationship among variables for this research that is focused on the analysis of the co-integration approach.
Solarin (2011)	Indonesia	2010 to 2013	It was shown that how social development affects economic growth rise usage of energy that led to rises carbon dioxide emission as well.
Shahateet (2014)	Indonesia	2010 to 2019	A study after forecast states that there will be a 5% rise in GDP development when the emission of CO_2 will rise with a rate of 3% in Indonesia.

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3- EXPERIMENTAL ANALYSIS

The object for empirical research is to find the existence of causality in the relationship among GDP per capita, consumption of energy and carbon dioxide gas emission. The annual data has been taken from 1970 to 2018 and Table 3 is indicating the basis of indicators. Here the variables or indicators are named as carbon dioxide gas emission will be denoted in analysis in units of per capita metric tons, GDPPC is denoting GDP per capita in 2000 US dollars and energy consumption per capita is denoted as ECPC. The software's that are used to process the analysis consist of Gretl and STATA.

All the indicators used in this research would be evaluated in terms of the logarithm. Table 4 is showing the investigative and probing data examination that is set and known. As it is clear from table 4 mean values are direct for all the indicators, 10-orderly numbers are near to mean value and there is no support of outlier values that have shown by inter-quartile. The analysis related to correlation is showing in a set of data that variables are strongly interlinked with each other. Correlation between CO2 and GDPPC is equal to 0.98, a correlation between CO2 and ECPC is equal to 0.99, a correlation between GDPPC and ECPC is equal to 0.97 and all variables are significant equivalent to 0.000.

The illustration of examination of our study validates the existence for strong interlink among all the variables and we have used a sort named Hodrick-Prescott to sort the data. It can be observed as well that by using a sort of filter which can outline the mechanism on base of consumption of energy and emission of carbon dioxide that is chased by Indonesia economy's extroverted and limited circumstances. On the other side consequently, static tests like as KPSS, PP, ERS and ADF were also applied for each indicator and sequence of time. These tests were applied firstly based on stages and then at the first differential.

The variables relating with 5% level of significance are unable to refuse from the null hypothesis as it can be seen in the test results given in the table. The condition to reject the null hypothesis is different for the KPSS test. The test gives different results with different approaches. At 95% level of confidence, last one test has rejected I(0) and certain for prior tests. So in this way, it can be assured that the variables are mobile at a stage but immobile at first disparity and can be denoted as I(1). The shown outcome can be dispersed in terms of the economy. The values that are shown at the level and first disparity may be influenced by distress in economical strategies or out of model depression phase as a whole. Therefore in aim to get the validity for the existence of breaks in structures we used CMR and ZA tests for this purpose in table 6.

From the outcome of the test economic theory was evident. When the structural pauses exist, distress will automatically lie there. The economic related policies were being changed in the second plan of five years from 1976 to 1981 and in prior years structural breaks also exist from 1975 to 1980. The policies that were implicated in the second-year plan produce higher development in GDP on an annual base, particularly in manufacturing sectors. This mechanism gives detail for a rise in energy consumption and carbon dioxide gas emission. In the third five years plan from 1981 to 1985 was made to make some improvements and innovations for advanced technology use and more skilled managerial techniques in terms of Government officials. In the last plan from 1996 to 2006 and 2007 in terms of first disparity has to face shocks related to currency and in the finance market. Crisis in currency and finance has suffered from the economy when shocks occurred.

Toda-Yamomoto test is applied for a purpose to validate the relationship between economic growth per capita, energy consumption and carbon dioxide gas emission. A VAR inferential analysis is permitted for non-Granger causality test which is not consistent on the procedure of co-integration. On the basis on historical series of data of consequences in table 7 can be seen.

Consequently, the test of Johansen and Juselius process 1990 was applied to derive the co-integrating vector numbers as shown in table 8. The criteria that are already set determined from lag orders which characterize the forecast error in Hannan and Quinn information criteria (HQIC), Akaike information criteria (AIC) and Schwarz information criteria (SBIC).

The null hypothesis at 5% level of significance was refused to accept in case of no Granger causality between GDP per capita and consumption of energy

and it can be seen in results. The case for Indonesia is different as it shows the causality in inverse direction and assures for the presence of conservation hypothesis. The conservation hypothesis will exist there where is single side causality moves from economic development to energy utilization in the case of Indonesia. As the economy of Indonesia is growing with time by time so the circumstances have shown that energy consumption is because of economic growth. In this way, the energy demand is rising in several energy sectors due to the rise in economic growth caused by more energy consumption. So to achieve more quick and rapid growth for an emerging state like Indonesia, it requires a large number of energy forms for fast growth.

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It can be seen from co-integration test outcomes that are failed to refuse from the non-co-integration null hypothesis. Johansen test application is enough receptive in case of long-run structural disruption as shown in table 5. To face these limitations a historical data is designed by the decomposition of generalized variance also known as GVDC as shown in table 9. The decomposition of variance is capable to disperse the changing and variations of endogenous variable. This separation will take place in the shock of an element of VAR to get informative data for consequences came from random modernization. The energy consumption is greater in real GDP whereas shocks for GDP per capita change the emission of carbon dioxide gas and energy consumption per capita for some time. For further years these circumstances will take die down in considerations.

Table 3. Number of variables

Variable	Explanation	Source
GDPPC	GDP per capita in 2000 US (improved at Geary Khamis PPP)	FRED
CO_2	Carbon dioxide gas emissions (per capita metric tons)	World Bank
EUPC	Energy consumption per capita, (kilograms equivalent to oil)	World Bank

Table 4. Investigative analysis of data

	Mean	SD	Min.	Max.	Ex. Kurtosis	10 Trim	IQR
PCGDP	3.8502	1.5134	2.4051	8.0429	0.85540	3.90	1.7321
CO2	0.63834	0.42636	0.26229	1.7014	0.13833	0.66	0.54688
PCEU	5.8273	0.32347	5.5239	6.5011	−0.46814	5.91	0.47191

Table 5. Outcomes of unit roots and stationary tests

Variables	ADF	ERS	PP	KPSS
		Stage		
PCGDP	−2.05 (−3.1)	−1.17 (−3.0)	−2.03 (−3.1)	0.45*** (0.1)
CO2	−2.06 (−3.1)	−1.11 (−3.1)	−2.15 (−3.1)	0.38*** (0.1)
PCEU	−1.05 (−3.1)	−1.83 (−3.1)	−3.05 (−3.6)	0.15*** (0.1)
		First disparity		
GDPPC	−6.288*** (−2.1)	−5.822*** (−2.5)	−6.29*** (−2.1)	0.35* (0.5)
CO_2	−3.0*** (−2.2)	−1.50 (−2.2)	−8.05*** (−2.5)	0.25 (0.5)
ECPC	−3.38** (−2.0)	−2.32*** (−2.0)	−8.11***(−2.9)	0.15 (0.5)

Note: In this analysis, the values given in brackets are denoting critical value at a level of 5%. '*' is showing probability value less than 0.1, '**" is showing probability value less than 0.05 and '***' is showing probability value less than 0.01.

Table -6 Consequences of unit root with structural breaks tests

Variable	ZA1	ZA2	CMR1	CMR2
		Stage		
GDPPC	−2.70 (1975)	−2.57(1997)	−2.16 (1973)	−2.06 (1985)
CO_2	−6.45*** (1976)	−6.05*** (1996)	−9.05*** (1977)	−2.51 (1984)
ECPC	−6.13*** (1984)	−5.15*** (1997)	−6.25*** (1980)	−3.01 (1987)
		First differences		
PCGDP	−7.05*** (1975)	−6.79 (1984)	−8.03*** (1985)	−6.13*** (1997)
CO2	−4.20 (1975)	−3.15 (1979)	−9.25*** (1975)	−5.77*** (1985)
PCEU	−6.15*** (2006)	−6.23*** (2007)	−2.45 (1975)	−1.15 (1971)

Note: '*' is showing probability value less than 0.1, '**" is showing probability value less than 0.05 and '***' is showing probability value less than 0.01. here ZA1 is showing a break in intercept or head off and ZA2 is showing pause in pattern or trend, CMR1 is indicating modernized outlier and CMR2 is stabilizing outlier.

Table 7. Causality outcomes by applying TodaYamamoto test.

Reliant variable	GDPPC	CO_2	ECPC
GDPPC	__	2064 (0.31)	2205 (0.31)
CO_2	1325 (0.48)	__	0457 (0.45)
ECPC	12253*** (0.000)	2202 (0.32)	__

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Note: '*' is showing probability value less than 0.1, '**" is showing probability value less than 0.05 and '***' is showing probability value less than 0.01.

Table 8. Application of Johansen's co-integration test

Null Hypo.	Other Hypo.	λ max	Trace	SBIC	HQIC	AIC
R=0	R=1	23.065	32.65	−5.45	−5.85	−5.100
R≤1	R=2	7.94*	7.93*	−7.03*	−7.42	−7.65
R≤2	R=3	0.02	0.021	−6.89	−7.21*	−7.42*

Table 9. Decomposition of variance

Percentage of variations	Time	Modernism	
ΔGDPPC		**ΔGDPPC**	**ΔCO₂ ΔECPC**
1		1.00*	0.00 0.00
3		0.93*	0.02 0.03
6		0.92*	0.032 0.04
10		0.91*	0.035 0.044
ΔCO₂			
1		0.00	0.99* 0.00
3		0.00	0.92* 0.077
6		0.099	0.78* 0.11
10		0.11	0.78* 0.11
ΔECPC			
1		0.04	0.035 0.92*
3		0.12	0.07 0.77*
6		0.18	0.13 0.65*
10		0.19	0.14 0.62*

Note: Here '*' is denoting the shocks itself.

4- CONCLUSION

The study, therefore, recommended to Indonesia's policymakers to focus on economic policies based on investments to find new sources of alternative energy in the face of rapid growth in aggregate demand. This situation also coincides with the assumption of energy efficiency and self-sufficiency in energy production that, in a later study model, could show how energy can lead to economic growth.

This article is based on time sequence several tests constitute on econometric techniques from 1970 to 2018 in Indonesia and has the aim to analyze the relationship among variables like carbon dioxide gas emissions, GDP per capita and consumption of energy. Different tests were performed to confirm the immobility for all the variables at the level of significance at 5% that was unable to refuse the hypothesis made for unit root test. Hence in this way structural break test was performed which depicts 80's and 90's plans of economics and also give detail for the crisis in the currency and finance market. Toda-Yamomoto test has shown meaningful and significant results that inversely emphasized on causality because of 'conservation hypothesis. The outcomes also verify the disintegration and variations in values per capita and recommend for effective policy to be implied. The consequences have shown that nation needs to have various kinds of energy utilization to get economic growth at a higher level.

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