DIGITALES ARCHIV

ZBW – Leibniz-Informationszentrum Wirtschaft
ZBW – Leibniz Information Centre for Economics

Osabohien, Romanus; Aderemi, Timothy Ayomitunde; Akindele, Dolapo Bose et al.

Article

Carbon emissions and life expectancy in Nigeria

International Journal of Energy Economics and Policy

Provided in Cooperation with:
International Journal of Energy Economics and Policy (IJEEP)

Reference: Osabohien, Romanus/Aderemi, Timothy Ayomitunde et. al. (2021). Carbon emissions and life expectancy in Nigeria. In: International Journal of Energy Economics and Policy 11 (1), S. 497 - 501.
https://www.econjournals.com/index.php/ijeep/article/download/10834/5665.
doi:10.32479/ijeep.10834.

This Version is available at:
http://hdl.handle.net/11159/8145

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

Standard-Nutzungsbedingungen:
Dieses Dokument darf zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden. Sie dürfen dieses Dokument nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, aufführen, vertreiben oder anderweitig nutzen. Sofern für das Dokument eine Open-Content-Lizenz verwendet wurde, so gelten abweichend von diesen Nutzungsbedingungen die in der Lizenz gewährten Nutzungsrechte. Alle auf diesem Vorblatt angegebenen Informationen einschließlich der Rechteinformationen (z.B. Nennung einer Creative Commons Lizenz) wurden automatisch generiert und müssen durch Nutzer:innen vor einer Nachnutzung sorgfältig überprüft werden. Die Lizenzangaben stammen aus Publikationsmetadaten und können Fehler oder Ungenauigkeiten enthalten.

Terms of use:
This document may be saved and copied for your personal and scholarly purposes. You are not to copy it for public or commercial purposes, to exhibit the document in public, to perform, distribute or otherwise use the document in public. If the document is made available under a Creative Commons Licence you may exercise further usage rights as specified in the licence. All information provided on this publication cover sheet, including copyright details (e.g. indication of a Creative Commons license), was automatically generated and must be carefully reviewed by users prior to reuse. The license information is derived from publication metadata and may contain errors or inaccuracies.

https://savearchive.zbw.eu/termsofuse

ZBW Leibniz-Informationszentrum Wirtschaft
Leibniz Information Centre for Economics

Mitglied der Leibniz-Gemeinschaft

International Journal of Energy Economics and Policy

ISSN: 2146-4553

available at http: www.econjournals.com

International Journal of Energy Economics and Policy, 2021, 11(1), 497-501.

Carbon Emissions and Life Expectancy in Nigeria

Romanus Osabohien[1,2]*, Timothy Ayomitunde Aderemi[3], Dolapo Bose Akindele[4], Lydia Bose Jolayemi[5]

[1]Department of Economics and Development Studies, Covenant University, Ota, Nigeria, [2]Centre of Economics Policy and Development Research (CEPDeR), Covenant University, Ota, Nigeria. [3]Department of Economics, Accounting and Finance, Bells University of Technology, Ota, Nigeria, [4]Department of Estate Management, Bells University of Technology, Ota, Nigeria, [5]Department of Economics, Kings University, Ode-Omu, Osun State, Nigeria. *Email: romanus.osabohien@covenantuniversity.edu.ng

Received: 27 July 2020 **Accepted:** 05 November 2020 **DOI:** https://doi.org/10.32479/ijeep.10834

ABSTRACT

The autoregressive distributed lag (ARDL) model was applied in the study to examine how energy consumption impacts on life expectancy in Nigeria. Data was sourced from the United States (US) Carbon Dioxide Information Analysis Centre, the Central Bank of Nigeria (CBN) Statistical Bulletin, International Energy Agency (IEA), and the World Development Indicators (WDI) for the period 1980-2017. Findings showed that inter alia; carbon emissions are significant and negatively affect life expectancy. This finding implied that, on average, carbon emissions could reduce life expectancy by 0.35%. Based on this finding, the study concludes by recommending that the Nigerian government should embark on the alternative use of energy that emits lesser carbon. Thus, this will help to attain the sustainable development goals of good health and well-being alongside with affordable, reliable and sustainable use of energy for all.

Keywords: Fossil Fuel, Electric Power, Carbon Dioxide, SDGs
JEL Classifications: P48, Q4

1. INTRODUCTION

It has been argued in the literature that economic development in most countries of the world has been the aftermath of the effective use of energy system (Afolayan et al., 2019; Matthew et al., 2018; Lu, 2017; Alege et al., 2016; Alaali et al., 2015). On the other hand, carbon emissions, released by the burning of fossil fuels, have brought about negative externalities across the globe. This is due to energy usage, especially fossil fuel alongside manufacturing and construction activities has shown a negative impact on the environment in the form of environmental degradation, poor health outcome, and reduced life expectancy, including aquatic life (Matthew et al., 2020; Balan, 2016; Mesagan and Ekundayo, 2015).

Economic growth is one macroeconomic goal that cannot be compromised in any developing economy, like in Nigeria. An attempt to achieve economic growth in a country spurs consumption of energy in various sectors of the economy. It is instructive to state that between the years 2000 and 2014, transport alone emitted an average of 47.76% of CO_2 gas in Nigeria (International Energy Agency, 2015). Consumption of fossil fuel has been found to be a critical source of CO_2 emission, orchestrating climate change globally and, unfortunately, Nigeria has been identified as one of the top producers and consumers of fossil fuel (Alege et al., 2017). It is essential to state that the consumption of fossil fuel deteriorates the quality of the environment and involves human health implications in the economy. In the same vein, the degradation of the environment increases budgetary allocation in terms of healthcare financing (Balan, 2016).

Consequently, in achieving sustainable economic growth, extensive use of energy cannot be avoided, as one needs to conduct manufacturing, agricultural activities, to provide services, and

This Journal is licensed under a Creative Commons Attribution 4.0 International License

to account for other sectors of the economy. Human activities pose a continuous threat to ecology and human life, in terms of environmental degradation and reduction of life expectancy. In order to guarantee healthy life and welfare to people in developing economies, like Nigeria, the United Nations sustainable development goal three (SDG3) emphasises the objective to secure by 2030 good health and well-being to citizens in developing economies. Meanwhile, in the case of Nigeria, the citizens' welfare has been at stake over the past few decades.

Evidence shows that the under-five mortality rate in Nigeria stands at an average of 147.4% of 1000 live births (United Nations Inter-Agency Group for Child Mortality Estimation, 2019). This assertion has been affirmed by the World Health Organisation -WHO (2004), when they reported that that in developing countries indoor smoke originated from solid fuel kills 100 children every hour and urban air pollution kills 1800 people. Recent studies have shown that life-threatening ailments are associated with the spillover effects of energy consumption in Nigeria (Matthew et al., 2018; Oguntoke and Adeyemi, 2017). Against this backdrop, answering the question on the effect of carbon emissions on life expectancy becomes highly imperative. As such, this study examines the nexus between carbon emissions and life expectancy in Nigeria. Remaining parts of this study are structured as follows: a review of related literature is presented in section two; section three shows the methodology of the study, analysis and discussion of results and policy recommendations of the study are presented in sections four and five, respectively.

2. EMPIRICAL REVIEW

Matthew et al. (2018) employed the autoregressive distribution lag (ARDL) econometric technique to examine the relationship between public health expenditure and health outcomes in Nigeria. Their study found a negative relationship between the emissions of greenhouse gas and health outcomes. To be explicit, the emissions of green gas caused a reduction in life of the Nigerian people. In another related study, Assadzadeh et al. (2014) investigated the variables that determined per capita health expenditures among the Organisation of Petroleum Exporting Countries, from 2000 to 2010. The focus of this study was to determine how life expectancy at birth responds to environmental quality. Estimated results showed that emissions of CO_2 had a positive relationship with expenditures on health, on the one hand, and an inverse correlation existed between life expectancy at birth and spending on health.

Work by Odusanya et al. (2014) assessed the nexus between real per capita health expenditure and per capita CO_2 emissions in Nigeria, over the time frame encompassing years 1960-2011. According to the study, both short-run and long-run estimates proved that increase in CO_2 emission would lead to a significant rise in health expenditures. Akin to Matthew et al. (2018); Odusanya et al. (2014), Yazdi et al. (2014) analysed, in the framework of ARDL technique, the connection between the quality of the environment and health expenditure in Iran, from 1967 to 2010. The study found that variables of interest had a long-run convergence. Also, the correlation between income, the pollutants, and health expenditures was positive in both the short-run and the long-run projections. In another perspective, Afolayan and Aderemi (2019) utilised Dynamic Ordinary Least Square and Granger causality approach to evaluate the impact of environmental quality on health effects in Nigeria, from 1980 to 2016. The study argued that emissions of CO_2 had an insignificant negative impact on mortality rate.

In the same vein, one-way feedback effect ran from CO_2 emission to electric power consumption, while fossil fuel consumption had a unidirectional causal relationship with mortality rate. Consequently, while adopting a panel least square to estimate the nexus between health outcome and quality of the environment in 25 European countries from 1995 to 2013, Balan (2016) suggested that bidirectional feedback effect existed between life expectancy and CO_2 emissions in the countries under study. Narayan and Narayan (2008) assessed from 1980 to 1999, how per capita health expenditures and quality of the environment are related in eight OECD economies by using a panel co-integration technique. It was found that all the variables of the study have a long-run convergence. Emissions of carbon monoxide and sulphur dioxide led to a rise in health expenditures in the countries. Similarly, Declercq et al. (2011) opined that if pollution from the industrial sector, which constitutes the primary source of air pollution in the majority of European cities, would be reduced, it could result in a rise of life expectancy at birth by 2 years.

Furthermore, in investigating the causal link between degrading of the environment and the rate of mortality in India, over close to four decades, from 1971 to 2010, Sinha (2014) reported that two-way feedback effect existed between the rate of infant mortality and CO_2 emission growth, on the one hand, and gross capital formation growth and rate of child mortality, on the other hand. In another view, Aye et al. (2017) applied the Dynamic Panel Threshold Model to estimate the effects of economic growth on CO_2 emissions, in developing economies. Authors concluded that the quality of the environment was declined owing to a rising agitation for high growth rate in those countries, which might have a negative implication on the health of the population, in the short run, but might be sustained, in the long run.

In a cross-sectional study of 49 counties of Canada, Jerrett et al. (2003) examined the nexus between the quality of the environment and spending in healthcare. It was determined that the greater the pollution, the greater the per capita health expenditures in those counties. In contrast, counties with environmental budget benchmarked had significantly lower spending on health issues. To summarise the above-reviewed studies, they indicated that increasing demand for health expenditure had been a result of continuous decay of environmental quality, leading to deterioration in health outcomes. Nevertheless, studies focusing on carbon emissions and life expectancy in Nigeria are very scanty in recent times, which calls for the need of our research, and justifies the authors' effort toward obtaining he results reported below.

3. METHODOLOGY

This study engaged secondary data for the analysis ranging from 1990 to 2018. Therefore, CO_2 emissions were extracted from the database of the US Carbon Dioxide Information Analysis Centre. Government health expenditure data was sourced from the CBN Statistical Bulletin. Total electric power and fossil fuel energy consumption data were sourced from the database of International Energy Agency (IEA), and data for life expectancy were sourced from the database of the World Development Indicators (WDI).

3.1. Model Specification

For addressing the objective of this study, the implicit form of the model is specified as Equation (1)

$$LE = f(CO_2, FFC, TEPC, EH) \quad (1)$$

Equation (1) is the implicit form of the mode, which is linearised in Equation (2), using a semi-double log:

$$LnLE_t = \beta_0 + \beta_1 \, LnCO_{2t} + \beta_2 \, FFC_t + \beta_3 \, LnTEPC_t + \beta_4 \, EH_t + U_t \quad (2)$$

This method of estimation was informed by the results of diagnostic tests, such as unit root test and bounds test performed on the data for the analysis in this study.

$$\Delta LnLE_t = \beta_0 + \sum_{i=1}^{p} \beta_1 \, \Delta Ln\,CO_{2t-1} + \sum_{i=0}^{p} \beta_2 \, \Delta FC + \sum_{i=0}^{p} \beta_3 \, \Delta LnTEPC_{t-1} + \sum_{i=0}^{p} \beta_4 \, \Delta EH_{t-1} + U_t \quad (3)$$

Where: LE is life expectancy, i.e., the average age of all individuals, who die in a particular year. CO_2 is an emission of carbon dioxide (in kiloton) from consumption of solid, liquid, and gas fuel or burning of bushes, construction industry, manufacturing activities etc. On its turn, FFC is energy consumption from fossil fuels, measured as a percentage of total energy consumption. TEPC represents the total electric power consumption, calculated as the total net consumption of the generating units and measured as in kilowatt-hours (kWh) per capita. EH is used to capture government health expenditure and is measured as the proportion of total government expenditure spent on healthcare. It is expressed in percentage. Timeframe t ranges from the year 1980 to 2016, while U_t is the error term.

The "a priori" expectation is that: β_1, β_2 <0 and β_3, β_4 > 0. This implies that the coefficient of carbon emissions, burning of fossil fuels (energy from fossil fuel) affect life expectancy negatively, meaning that their estimated coefficient should be less than the unity, but greater than zero. This literally means that fossil fuels and carbon emissions, when inhaled, have a negative effect on human health, reducing life expectancy (Matthew et al., 2018). β_3, β_4 >0 means that the expected coefficient of electricity usage and government funding of the health sector should positively impact health outcomes. Their coefficient should be positive, more significant than zero, but not equal to one.

4. RESULTS AND DISCUSSION

In Table 1, it could be deduced from the estimated descriptive statistics that log of life expectancy in 36 years has 3.8 years and 3.9 years as its minimum and maximum values, respectively. Also, the mean value and standard deviations are 3.86 years and 0.071 years, respectively. The mean value is greater than the standard deviation; therefore, it can be stated that data were not widely dispersed during the periods under investigation. In the same vein, all other variables of interest in this study followed the same pattern, like life expectancy data.

Furthermore, in checking the symmetrical distribution of data series, the skewness and kurtosis of data were examined. Table 2 reveals that all variables of interest, except for $LnCO_2$, are positively skewed with kurtosis values very close to 3.00. This attests that the distribution of these series is relatively symmetrical, which in agreement with the basic assumption of econometric analysis.

Test for the stationary property of time series data in empirical analysis has become more pronounced in recent literature. This is a consequence of the fact that time series data are usually linked with stationarity problems, which generally motivate spurious results in the analysis and, consequently, spells doom for policy formulated based on the spurious results. To avert the problem of spurious findings in this study, an attempt was made to verify the behaviour of the series via the standard Augmented Dickey and Fuller and Phillips and Perron (PP) tests. Estimated results presented in Table 2 indicated that only one variable, FFC, is stationary in its native form. In contrast, the other variables are different. This implies that the study made use of the combination of data with various orders of integration, i.e., I (1) and (0) and, as such, Autoregressive Distributed Lagged (ARDL) Model was subsequently estimated (Pesaran et al., 2001, Pesaran and Pesaran, 1997).

In testing for the existence or the long-run convergence among the variables of interest, this study employed the Bound Test technique. It was discovered from the estimated results that the Null hypothesis of no long-run relationships exists, and was accepted as a result of the F-Statistic value (1.81) that is less than the upper and lower Critical (3.52) Value Bounds at 5% level of significance. Hence, it was concluded that no long-run relationship exists between energy consumption and life expectancy in Nigeria. The short-run relations will be estimated within the ARDL framework.

Table 3 shows the estimates of the relationship between carbon emissions and life expectancy in Nigeria. From the estimated results presented in Table 3, all parameters have the expected signs, except the expenditure on health. The lagged value of life expectancy is negative. This shows that life expectancy in the previous year causes a reduction in life expectancy in the current year. However, emissions of carbon dioxide and life expectancy have an inverse relationship. This relationship is significant at 5% level of significance. A unit change in emissions of carbon dioxide results in 0.002% reduction of life expectancy in Nigeria. This finding is an agreement with results by Afolayan and Aderemi (2019) and Declercq et al. (2011) in similar studies conducted in Nigeria and European cities, though a different methodology was adopted.

Table 1: Descriptive statistics of variables

Descriptive statistics	LnLE	$LnCO_2$	FFC	LnTEPC	EH
Mean	3.863332	11.09797	19.63000	4.570880	2.990571
Median	3.835574	11.15472	19.71000	4.508990	2.400000
Maximum	3.963096	11.57184	22.84000	5.054525	7.300000
Minimum	3.818811	10.46880	15.89000	3.929273	1.100000
Std. deviation	0.045911	0.373742	1.636799	0.267958	1.714216
Skewness	1.087375	-0.356473	0.088005	0.011091	0.835393
Kurtosis	2.630499	1.644621	2.437245	2.549871	2.628861
Jargue-Bera	7.096354	3.420295	0.507022	0.296199	4.271848
Probability	0.028777	0.180839	0.776071	0.862345	0.118135
Sum	135.2166	388.4290	687.0500	159.9808	104.6700
Sum. Sq. deviation	0.071667	4.749216	91.08980	2.441255	99.91019
Observation	36	36	36	36	36

Source: Authors'

Table 2: Unit root test

Variable	ADF test		
	Level	1st Diff	Remark
LnLE	−2.957110	−2.957110	I(1)
$LnCO_2$	−2.945842	−2.948404	I(1)
FFC	−2.951125	-	I(0)
LnTEPC	−2.948404	−2.951125	I(1)
EH	−2.945842	−2.951125	I(1)
	Philip perron		
	Level	1st Diff	
LnLE	−2.945842	−2.948404	I(1)
$LnCO_2$	−2.945842	−2.948404	I(1)
FFC	−2.948404	-	I(0)
LnTEPC	−2.948404	−2.951125	I(1)
EH	−2.945842	−2.948404	I(1)

Source: Authors'. ADF: Augmented Dickey-Fuller

Table 3: Short-run relationship between carbon emissions and life expectancy

Short Run	Coefficient	T-statistics	Prob. value
D(LnLE(-1)	−1.046676***	10.92787	0.0000
D(Ln)	−0.002411**	2.018188	0.0579
D(FFC)	−0.000139	0.796333	0.4357
D(TEPC)	0.004022*	1.975020	0.0630
D(EH)	−4.63E-05	0.202719	0.8415
R-Squared	0.999753		

Source: Authors'

In the same vein, the consumption of fossil fuel energy has a negative relationship with life expectancy. Though, the relationship is not significant at 10% significance level. A unit change in consumption of fossil fuel energy brings about 0.13% reduction in life expectancy in Nigeria. Nevertheless, total electric power consumption has a positive impact on life expectancy in Nigeria. The effect is significant at the 10% significance level. A unit change in total electric power consumption increases life expectancy by 0.4% in the country. This finding contradicts the conclusions by Afolayan and Aderemi (2019). Moreover, the relationship between health expenditure and life expectancy is negative, though not significant at 10% level of significance. The reason for this relationship might relate to the lack of sufficient funding in the health sector and gross misappropriation of public funds in the public sectors in the country.

5. CONCLUSION

In this study, an attempt has been made to examine the impact of carbon emission on life expectancy in Nigeria, using the ARDL for the period from 1980 to 2016. Our findings show that the lagged value of life expectancy is negative. Emissions of carbon dioxide and life expectancy have an inverse relationship. This relationship is significant at 5% level of significance—a unit change in emissions of carbon dioxide results in 0.002% reduction in life expectancy in Nigeria. Consumption of fossil fuel energy has a negative relationship with life expectancy.

Though the relationship is not significant at the 10% level, the total electric power consumption has a positive impact on life expectancy in Nigeria. The effect is significant at 10% level. Moreover, the relationship between health expenditure and life expectancy is negative, though not significant at 10% level. Therefore, it can be concluded that carbon emissions reduce life expectancy in Nigeria. This implies that there is a trade-off between carbon emissions and life expectancy. Based on this finding, this study recommends that policymakers in Nigeria should achieve their sustainable development goals of good health and well-being alongside with affordable, reliable, and sustainable use of energy for all, the Nigerian government should embark on the alternative use of energy that generates less carbon dioxide emission. Also, government expenditure on health should be increased substantially in order to provide amenities that guarantee an increment in life expectancy in Nigeria.

6. ACKNOWLEDGMENT

Authors appreciate the publication support from Covenant University Centre for Research, Innovation and Discovery (CUCRID).

REFERENCES

Afolayan, O.T., Aderemi, T.A. (2019), Environmental quality and health effects in Nigeria: Implications for sustainable economic development. SSRG International Journal of Economics and Management Studies, 6(11), 44-55.

Afolayan, O.T., Okodua, H., Matthew, O., Osabohien, R. (2019), Reducing unemployment malaise in Nigeria: The role of electricity consumption and human capital development. International Journal of Energy Economics and Policy, 9(4), 63-73.

Alaali, F., Roberts, J., Taylor, K. (2015), The Effect of Energy Consumption and Human Capital on Economic Growth: An Exploration of Oil Exporting and Developed Countries. Sheffield Economic Research Paper Series No. 2015015. Sheffield, England: The University of Sheffield.

Alege, P.O., Adediran, O.S., Ogundipe, A.A. (2016), Pollutant emissions, energy consumption and economic growth in Nigeria: A multivariate granger causality framework. International Journal of Energy Economics and Policy, 6(2), 202-207.

Alege, P.O., Oye, Q.E., Adu, O.O., Amu, B., Owolabi, T. (2017), Carbon emissions and the business cycle in Nigeria. International Journal of Energy Economics and Policy, 7(5), 1-8.

Assadzadeh, A., Faranak, B., Amir, S. (2014), The Impact of Environmental Quality and Pollution on Health Expenditures: A Case Study of Petroleum Exporting Countries. Sydney, Australia: Proceedings of 29th International Business Research Conference. p24-5.

Aye, G.C., Edoja, P.E., Charfeddine, L. (2017), Effect of economic growth on CO2 emission in developing countries: Evidence from a dynamic panel threshold model. Cogent Economics and Finance, 5(1), 1-22.

Balan, F. (2016), Environmental quality and its human health effects: A causal analysis for the EU-25. International Journal of Applied Economics, 13(1), 57-71.

Declercq, W., Wirawan, E., Walle, L.V., Kersse, K., Cornelis, S., Claerhout, S., Vanoverberghe, I., Roelandt, R., De Rycke, R., Verspurten, J., Agostinis, P. (2011), Caspase-mediated cleavage of Beclin-1 inactivates Beclin-1-induced autophagy and enhances apoptosis by promoting the release of proapoptotic factors from mitochondria. Cell Death & Disease, 1(1), e18.

International Energy Agency. (2015), Value of CO2 Emissions from Transport (% of Total Fuel Combustion) in Nigeria. Available from: http://www.iea.org/stats/index.asp. [Last accessed on 2019 Jun 12].

Jerrett, M., Eyles, J., Dufournaud, C., Birch, S. (2003), Environmental influences on healthcare expenditures: An exploratory analysis from Ontario, Canada. Journal of Epidemiology and Community Health, 57, 334-338.

Lu, W.C. (2017), Greenhouse gas emissions, energy consumption and economic growth: A panel cointegration analysis for 16 Asian countries. International Journal of Environmental Research and Public Health, 14(11), 1436.

Matthew, O.A., Ede, C.U., Osabohien, R., Ejemeyovwi, J., Fasina, F.F., Akinpelumi, D. (2018), Electricity consumption and human capital development in Nigeria: Exploring the implications for economic growth. International Journal of Energy Economics and Policy, 8(6), 8-15.

Matthew, O.A., Owolabi, O.A., Osabohien, R., Urhie, E., Ogunbiyi, T., Olawande, T.I., Daramola, P.J. (2020), Carbon emissions, agricultural output and life expectancy in West Africa. International Journal of Energy Economics and Policy, 10(3), 489-496.

Mesagan, E., Ekundayo, P. (2015), Economic growth and carbon emission in Nigeria. IUP Journal of Applied Economics, 3(2), 44-56.

Odusanya, I.A., Adegboyega, S.B., Kuku, M.A. (2014), Environmental quality and health care spending in Nigeria. Fountain Journal of Management and Social Sciences, 3(2), 57-67.

Oguntoke, O., Adeyemi, A. (2017), Degradation of urban environment and human health by emissions from fossil-fuel combusting electricity generators in Abeokuta Metropolis, Nigeria. Indoor and Built Environment, 26(4), 538-550.

Pesaran, M., Pesaran, B. (1997), Working with Microfit 4.0: Interactive Econometric Analysis. New York: Oxford University Press.

Pesaran, M.H., Shin, Y., Smith, R.J. (2001), Bounds testing approaches to the analysis of level relationships. Journal of Applied Econometrics, 16, 289-326.

Sinha, A. (2014), Carbon emissions and mortality rates: A causal analysis for India (1971-2010). International Journal of Economic Practices and Theories, 4(4), 486-492.

United Nations Inter-Agency Group for Child Mortality Estimation. (2019), Explanatory Notes Child Mortality Trend Series to 2018. New York: UNICEF, World Health Organization, United Nations Population Division, World Bank Group.

World Health Organization. (2004), The 10 Leading Causes of Death by Broad Income Group. Available from: http://www.who.int/mediacentre/factsheets/fs266/en/index.html. [Last accessed on 2009 Jun 23].

Yazdi, S.K., Zahra, T., Nikos, M. (2014), Public Healthcare Expenditure and Environmental Quality in Iran. Recent Advances in Applied Economics. Available from: http://www.wseas.us/e-library/conferences/2014/Lisbon/AEBD/AEBD-17.pdf. [Last accessed on 2019 Jul 24].