

## ORIGINAL RESEARCH ARTICLE

# Political factors, carbon emissions, and life expectancy in India: Implications for the Sustainable Development Goal 3

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## Abstract

This study examines the nexus among political factors, carbon emissions, and life expectancy between 1990 and 2020 in India. Data for this study was extracted from the World Bank Development indicators, after which it was subjected to econometrics analysis. The results showed that on averages, between 1990 and 2020, India experienced a life expectancy around 65 years. Fossil fuel energy consumption represents a small proportion of total energy consumption in India. However, carbon emissions and life expectancy have a positive and significant relationship. Fossil fuel usage and life expectancy possess a significantly positive relationship (FFEC = 0.044128, P-value = 0.0023). Moreover, government effectiveness and life expectancy have a significant direct relationship. Political stability and life expectancy have a significant negative relationship in the country. We conclude that policymakers in India should ensure that carbon emissions and fossil fuel usage in India do not pose a threat to life expectancy. Efforts should be put in place by policymakers in India to increase life expectancy, a strategic component of SDG 3- good health and well being for all at all ages, by ensuring stable political climate, good governance and efficient health enhanced public policies. (*Afr J Reprod Health* 2024; 28 [3]: 74-80).

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**Keywords:** Politics, good governance, CO<sub>2</sub> and SDG 3

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## Résumé

Cette étude examine le lien entre les facteurs politiques, les émissions de carbone et l'espérance de vie entre 1990 et 2020 en Inde. Les données de cette étude ont été extraites des indicateurs de développement de la Banque mondiale, après quoi elles ont été soumises à une analyse économétrique. Les résultats ont montré qu'en moyenne, entre 1990 et 2020, l'Inde a connu une espérance de vie d'environ 65 ans. La consommation d'énergie fossile représente une petite proportion de la consommation totale d'énergie en Inde. Cependant, les émissions de carbone et l'espérance de vie ont une relation positive et significative. L'utilisation de combustibles fossiles et l'espérance de vie possèdent une relation significativement positive (FFEC = 0,044128, valeur P = 0,0023). De plus, l'efficacité du gouvernement et l'espérance de vie ont une relation directe significative. La stabilité politique et l'espérance de vie ont une relation négative significative dans le pays. Nous concluons que les décideurs politiques indiens devraient veiller à ce que les émissions de carbone et l'utilisation de combustibles fossiles en Inde ne constituent pas une menace pour l'espérance de vie. Des efforts devraient être mis en place par les décideurs politiques indiens pour augmenter l'espérance de vie, une composante stratégique de l'ODD 3 - bonne santé et bien-être pour tous à tout âge, en garantissant un climat politique stable, une bonne gouvernance et des politiques publiques efficaces et améliorées en matière de santé. (*Afr J Reprod Health* 2024; 28 [3]: 74-80).

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**Mots-clés:** Politique, bonne gouvernance, CO<sub>2</sub> et ODD 3

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## Introduction

India, also known by its official name, the Republic of India, is a massive and culturally diverse country that is located in South Asia. With a population that is greater than 1.3 billion, it holds the position of being the world's most populated country, accounting for approximately one-seventh of the global populace. India's rich historical and cultural heritage, along with its economic significance,

makes it a compelling subject for exploration. The country's distinctive political landscape plays a central role in shaping its environmental policies, industrial development, and public health outcomes. The intricate interplay of political elements, carbon emissions, and life expectancy in India presents a multifaceted and challenging issue<sup>1-4</sup>.

In the recent times, due to the overwhelming aftermath effect of climate change

on human life, the Indian government has acknowledged the significance of tackling carbon emissions. Carbon discharge predominantly has a substantial impact on global climate change and environmental deterioration. Recognizing and dealing with carbon emissions is a pivotal component of alleviating the consequences of climate disruptions and securing a viable posterity for everyone. India, being one of the most densely populated and swiftly advancing nations globally, holds a vital position in the global endeavor to diminish carbon emissions<sup>5</sup>. Carbon emission in India represent a multifaceted challenge, intertwined with factors like economic expansion, energy usage, and environmental sustainability. India's economic progress in recent decades has been remarkable, positioning the country as one of the world's swiftly expanding major economies.

However, this economic boom has come hand-in-hand with a substantial surge in energy consumption, resulting in an increase in carbon emissions<sup>6,7</sup>. In view of the above, the advancement of economies around the world without entangling with the environmental ecosystem requires effective energy management<sup>8</sup>. In contrast, the real world situation has shown that the inflammation of hydrocarbon fuel and other forms of carbon footprint have had negative consequences. The primary reason for this is the negative effects that human activities like energy consumption, particularly the use of fossil fuels, industry, and construction have had on the environment<sup>9-12</sup>. As a result of this, there is an urgent need for a deeper exploration of how carbon emissions and political factors influence life expectancy in India. This study is highly imperative because life expectancy in India does not only fall short of international benchmarks but also behind many neighboring countries. With the exception of Pakistan and Afghanistan, India has a lower life expectancy compared to the rest of the South Asian nations<sup>13-15</sup>. Against this backdrop, the current study seeks to address this critical gap in existing literature by exploring the influence of political factors and carbon emissions as determinants of life expectancy in India.

### **Literature review**

Odusanya *et al*<sup>16</sup> looked into whether or not there was a correlation among real per capita expenditures on healthcare and per capita CO<sub>2</sub>

discharge. The study revealed that an expansion in CO<sub>2</sub> emissions led to a large increase in healthcare expenses. Aye *et al.*<sup>17</sup> also analyzed the effect that growing economies have on CO<sub>2</sub> emissions, specifically developing countries. The authors concluded that increasing rates of development in the countries have led to declines in environmental quality, which might have severe short-term repercussions for population health but might be sustainable in the long run. Assadzadeh<sup>18</sup> carried out a study that examined the factors that influence per capita healthcare expenses among the member countries of the Organization of Petroleum Exporting Countries (OPEC). The purpose of the study was to determine whether or not environmental quality had an effect on life expectancy in the OPEC countries. The results of the study showed that there was a positive correlation between life expectancy at birth and healthcare costs, while there was a negative correlation between discharge and health services expenses. Yazdi *et al*<sup>19</sup> investigated the correlation between the state of the surrounding and the amount of money spent on medical treatment in Iran between 1967 and 2010. The findings showed that there was a favourable association between earnings, contamination, and healthcare expenses, both in the short-run and in the long-run basis. Declercq *et al*<sup>20</sup> claimed that there is a potential for a two-year rise in life expectancy at birth if pollution from the industrial sector, which is the dominant source of air pollution in the majority of European towns, could be reduced.

In his investigation into the causal link between environmental degradation and the rate of mortality in India from 1971 to 2010, Sinha<sup>21</sup> found that there was a two-way effect between the rate of infant mortality and the growth of CO<sub>2</sub> emissions on the one hand, and the rate of child mortality and the growth of gross capital formation on the other.

Matthew *et al.*<sup>9</sup> examined the relationship between Nigeria's public health spending and the country's overall health status. According to the results from the study, there was an inverse interaction between greenhouse gas emissions and the state of people's health in Nigeria.

Afolayan and Aderemi<sup>8</sup> carried out research to investigate the ways in which environmental factors impact human health. The results showed that the influence of CO<sub>2</sub> discharge on the death rate was both insignificant and

negative. The study also found that there was a unidirectional causal connection between CO2 emissions and the usage of electric power, but consumption of fossil fuels was found to have a connection with the death rate. In a study that was conducted in 25 European nations. Balan<sup>11</sup> used panel least square analysis to investigate the connection between health outcomes and environmental quality. According to the findings of the research, there was a two-way chain of events that led to a causal relationship between CO2 emissions and life expectancy in the nations that were analyzed.

**Methods**

**Research design**

Expo facto research design was chosen as the best research design for this study because it was the

most technical way to meet the study's objective. The study used secondary data to explore the ways in which political issues and carbon emissions can cause differences in life expectancy in India. In this study, life expectancy is used as the dependent variable and carbon emissions, fossil fuel energy consumption, political stability and government effectiveness were employed as the set of explanatory variables.

**Source of data and scope of the study**

The study analysed annual time series data between 1990 and 2020 to investigate the relationship between political issues, carbon emissions, and life expectancy in India. The data were extracted from the World Development Indicators published by the World Bank<sup>22</sup>.

**Table 1:** A priori expectations and data source

Abbreviation	Variables	Parameters	Expected Value
CO2	Carbon Emissions	$\beta_1$	Negative (-)
FFEC	Fossil fuel Energy Consumption	$\beta_2$	Negative (-)
PS	Political Stability	$\beta_3$	Positive (+)
GE	Government Effectiveness	$\beta_4$	Positive (+)

Source: Authors` (2023)

**Table 2:** Measurement and operation definitions of variables

Abbreviation	Description of Variables
LE	Life expectancy at birth, total (years).
CO2	Carbon dioxide emissions, measured in kilotons, are caused by burning bush, burning solid, liquid and petrol fuels, as well as by manufacturing, construction and other activities.
FFEC	Fossil fuel usage expressed as a proportion of total energy consumption.
PS	Political stability is a metric that gauges people's beliefs about the probability of political instability or violence with political motivations, such as terrorism.
GE	Government effectiveness assess the perception of public service quality, the efficiency of the civil service independent from political influence, the effectiveness of the policy development and implementation, and the credibility of the government's dedication to these goals.

Source: Authors` (2023)

**Model Specification**

In addressing the objective of the study, the implicit form of the model was drawn from the past studies such as Lucas *et al.*<sup>23</sup> and Zhou *et al.*<sup>24</sup>. The model is stated as thus;

$$LE = f(CO_2, FFEC, PS, GE) \tag{1}$$

Transformation of equation (1) into econometrics model results into the following equation.

$$LE_t = \beta_0 + \beta_1 LCO_{2t} + \beta_2 FFEC_t + \beta_3 PS_t + \beta_4 GE_t + \mu_t \tag{2}$$

Furthermore, it is necessary to state the study's apriori expectations in order to determine whether the empirical inquiry in India is in line or not with the apriori expectations. The information is summarised in Table 1. In order to provide

extensive information about how the study's variables are operationally defined, the variables are summarised in Table 2.

**Data analysis**

**Estimation procedures**

To estimate the dependent variable and set of the independent variables, this study embarks on preliminary analyses performed on the data, they included:

**Descriptive Statistics:** These were used to describe the main characteristics of data in a study, and they provide succinct summaries of the sample. The statistics provide comprehensive information regarding the characteristics, distribution, and behavior of the variables under consideration by presenting statistics such as the mean, median, kurtosis, skewness, standard deviation, maximum and minimum value among others.

Consequently, the preferred methods of estimation for the study is dynamic ordinary least squares regression. This is an analytical technique used to estimate unknown parameters in the study. This is a regression that includes deterministic variables, integrated processes and their powers as regressors. The errors are allowed to be correlated across

equations, over time and with the regressors. Also, the regression is constructed in such a way that the usual least squares procedure yields asymptotically efficient estimators.

**Ethical consideration**

The data in the World Development Indicators were obtained using appropriate ethical procedures and guidelines. Consequently, further ethical issues were minimal. The data were completely anonymized, while the data was already freely available to the general public. Hence, further ethical clearance was not obtained for this study.

**Results**

**Descriptive statistics**

Descriptive statistics is a group of methods used to characterize and summarize a dataset's key aspects. The data's central tendencies, variability, and distribution can be better understood with the use of these statistics. Instead of trying to extrapolate meaning from the data, descriptive statistics look for patterns and themes to provide a high-level overview of the data. The primary properties of a dataset can be summarized and described with the help of descriptive statistics. They shed light on how the study's variables fared in practice.

**Table 3:** Descriptive statistics for political factors, carbon emissions and life expectancy in India

	LE (Years)	LCO2 (kilotons)	FFEC (%)	PS(-2.5 to 2.5)	GE(-2.5 to 2.5)
Mean	64.92542	13.55662	1.425816	0.284937	0.211494
Median	64.99600	13.44784	1.426479	0.270124	0.201372
Maximum	70.91000	14.23198	1.458227	0.387068	0.305510
Minimum	58.65200	12.91271	1.382438	0.192247	0.168259
Std. Dev.	3.902366	0.416123	0.022013	0.068096	0.035455
Skewness	0.015024	0.249642	-0.314336	0.327354	1.298003
Kurtosis	1.729934	1.787599	2.146691	1.544696	3.790388
Jarque-Bera	2.084712	1.934102	1.170171	3.289294	9.511781
Probability	0.352623	0.380203	0.557058	0.193081	0.008601
Sum	2012.688	366.0287	35.64540	8.833054	6.556322
Sum Sq. Dev.	456.8538	4.502117	0.011630	0.139113	0.037712
Observations	31	31	31	31	31

Source: Authors` (2023)

In order to deepen a comprehensive understanding of the nexus among political factors, carbon emissions, and life expectancy in India, Table 3 summarizes the descriptive statistics of these variables as follows. Life expectancy (LE) in India ranges from a maximum of 70.9 years to a minimum of 58.6 years. However, the mean value of life expectancy in the country is 64.9 years.

In the same vein, the mean value for carbon emissions-LCO2 is 13.5kilotons, while the minimum and maximum values are 12.9kilotons and 14.2kilotons respectively. However, the mean value for fossil fuel energy consumption-LFFEC is 1.425816% alongside its maximum and minimum values, which are 1.45% and 1.38% simultaneously. However, political stability has a

**Table 4:** Dynamic Ordinary Least Squares regression of political factors, carbon emissions and life expectancy in India

Dependent Variable: LE

Independent Variables	Coefficient	Std. Error	t-Statistic	Prob.
LCO2	2.04E-06**	5.86E-07	3.474955	0.0052
LFPEC	0.173677**	0.044128	3.935746	0.0023
PS	-25.07966*	2.660824	9.425525	0.0000
GE	10.69283**	4.270683	2.503774	0.0293
R-squared	0.999365			
Adjusted R-squared	0.998443			

Source: Authors` (2023)      **Notes:** \*Significant at 1% \*\*significant at 5% \*\*\*Significant at 10%

mean value of 0.28. It is instructive to state that political stability recorded the highest value of 0.38 and the lowest value of 0.19 respectively. Fossil fuel usage possessed a mean value of 1.43% alongside 1.46% and 1.38% as its maximum and minimum values simultaneously. In addition, government effectiveness ranges from a minimum of 0.17 to a maximum of 0.30, with a mean value of 0.211%.

Table 4 presents the outcomes of the dynamic ordinary least squares analysis of the relationship among political factors, carbon emissions and life expectancy in India. From the results, the power of the model could be adjudged to be relatively strong because the explanatory variables, carbon dioxide emissions, fossil fuel usage, political stability, and government effectiveness explained about 99% variation in the dependent variable, life expectancy. Consequently, carbon emissions and life expectancy have a positive and significant relationship in India. On the same page, fossil fuel usage and life expectancy possess a significantly positive relationship in the country. Government effectiveness and life expectancy have a significant direct relationship. However, political stability and life expectancy have a negative relationship that is significant at 1% level of significance.

## Discussion

In order to deepen a comprehensive understanding of the nexus among political factors, carbon emissions, and life expectancy in India, discussion of findings of this study are enunciated as follows; life expectancy (LE) in India ranges between 58.6 years and 70.9 years. However, the mean value of life expectancy in the country is 64.9 years. This shows that on average basis, between 1990 and

2020, the residents of India die around age of 65 years. In the same vein, the mean value for carbon emissions is 1.35 million Kt. This is an indication that amount of carbon emissions in India has been profound over the time. The reason for this might be attributed to huge industrial activities alongside the teeming population making use of energy on daily basis. Similarly, the mean value for fossil fuel energy consumption is 1.42%. This implies that fossil fuel energy consumption represents a small proportion of total energy consumption in India. However, political stability has a mean value of 0.28. It is instructive to state that this figure shows that political stability is very low in India. In the same vein, government effectiveness recorded a mean value of 0.211, which is very low comparing to the global benchmark of 2.5. This is the evidence that inefficient governance was stimulated by political factor in India. In view of this, the policymakers in should prioritize creating a stable political environment through good governance in the country.

Consequently, carbon emissions and life expectancy have a positive and significant relationship in India. However, this finding is contrary to the a priori expectation. Based on the finding, a unit rise in carbon emissions increases life expectancy by 2 years in India. The reason for this positive result might be linked to the high level of sophistication in the India's health sector which could have insulated the vast majority of Indians from the nefarious influence of carbon emissions on human security. Similarly, contrary to the expectation of the study, fossil fuel usage and life expectancy possess a significantly positive relationship in India. As such, a unit rise in fossil fuel usage, causes the life expectancy to rise by 0.17% in the country. It is instructive to stress that despite the fact that India has a resilience health

sector, the proportion of fossil fuel usage in India is very small. This might be one of the reasons why fossil fuel has not adversely affected life expectancy in the country. Therefore, the policymakers in India should maintain the status quo by ensuring that carbon emissions and fossil fuel usage in India do not pose a threat to life expectancy in the future. Also, the policy and programme that will promote SDG 3- good health and well being for all at all ages should be embarked upon by all the relevant stakeholders in the country.

Moreover, government effectiveness and life expectancy have a significant direct relationship. Based on this study, a unit change in government effectiveness increases life expectancy by 10 years. This is an indication that efficiency of governance is a major contributory factor that spurs a rise in life expectancy in the country. Whereas, political stability and life expectancy have a significant negative relationship in India. This shows that political factor represents a major force that reduces life expectancy in India. This is because instability of the political climate could lead to bad governance that suppresses public health initiatives that are supposed to catalyze good health and well being of the citizenry. Against this backdrop, any time the policymakers in India wish to increase life expectancy which is the strategic component of SDG 3- good health and well being for all at all ages, stable political climate, good governance and efficient health enhanced public policies should be put in place in the country.

### Strengths and limitations

The strength of this study lies in its high level of novelty in the literature because studies that focused on the nexus among political factors, carbon emissions and life expectancy are very scarce. Similarly, this study has a clearly stated research question, and comprehensive descriptive and econometric methods of analysis, which would make the contents of the study to be easily understood by both experts and laymen. The study is limited because it focuses on India only. Further studies could be carried out on other Asian countries, especially those countries with political instability and high level of carbon emissions.

### Conclusion

This study therefore concludes that on average basis, between 1990 and 2020, the residents of India had an average life expectancy of 65 years. Fossil fuel energy consumption represents a small proportion of total energy consumption in India. However, political stability is very low in India. Inefficient governance was stimulated by political factor in India. Also, carbon emissions and life expectancy have a positive and significant relationship in India. Similarly, contrary to the expectation of the study, fossil fuel usage and life expectancy possess a significantly positive relationship in India. Moreover, government effectiveness and life expectancy have a significant direct relationship. Political stability and life expectancy have a significant negative relationship in the country.

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