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ECONOMIC DEVELOPMENT AND ENVIRONMENTAL DEGRADATION IN INDIA, A TIME SERIES ANALYSIS FROM 1960-2018

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ABSTRACT

Development is simply not only a term of economic growth, rather it is a process of transformation one's wellbeing from monetary to his contribution on pressure upon the planet. That's why Amartya Sen very rightly remarked that now a day everybody knows about Gross Domestic Product (GDP) that it is a very crude indicator of development of a nation (Sen A, 2020). Conventionally rising Gross Domestic Products is considered as Economic development, and later on it extends to per capita income (PCI) of a country. During seventies and eighties decades of twentieth century a process starts connecting growth with development.



KEYWORDS: Indian Education System , improved education, challenges.

INTRODUCTION

Drastic Climate change, severe loss of bio-diversity, and very recently covid-19 pandemic increases the human insecurity upon this earth. This overlays the inequality problems on Human development. Realising this entire fact UNDP revisited Human Development concept keeping in mind the notion human security. But the force we put on the globe have such a vibrant effect that scientists bound to believe that the world has entered into a new geological epoch which is called the Anthropocene, the age of humans. In other words, we are the first homo sapiens who survive in such an age which defined by our own choice, where challenge arise for surviving from ourselves. (HDR 2020). In this explosive world, where threat accompanying with global constraint like climatic changes and biodiversity loss are coated on inequalities, our societies are being put the test. Covid-19 is the recent externalization of all these disorders. Office of the Human Development Report considered that only Human Security can help to realize these challenges and frame responses to them. A high-level advisory panel of UNDP advised to prepare even a separate publication for the next Human Development Report of 2021.

With these growing needs of the earth, this is the high time to rethink the term growth, development and sustainability, especially with environmental degradation. So, it is a humble attempt to link development with environment.

MAJOR RESEARCH WORKS REVIEWED:

Number of studies have reviewed and found almost similar conclusion that Human Development has a severe consequence on climate change. Most of them proved with empirical evidence with Indian states. Conversely Economic growth or development is possible only on cost of environment. They showed how various development strategies and excessive emphasis on per capita GDP is responsible for climatic change. Vipin Chandra K.P. and et al. (2012), Neil P. (2010), Nemat S. (1994), Ghosh M (2006) all those showed the risk of climate change which could threaten human security.

Another few papers directly dealt with the unidirectional relationships of most prominent environmental parameter i.e. CO₂ emissions, coal consumptions and energy consumption with economic growth of India. Among them Basak P. (2014), Ghoshal T and et al. (2007) and Mishra K. (2019)'s work is noteworthy. Mishra K. (2019) made a study on the modeling of CO₂ emission with a system of state-wise analytical differential model of CO₂ emission using the data set of 21 years from 1980 to 2000 of states of India.

Few other theoretical and analytical paper also been reviewed and found development is an evolutionary process which changes over the needs of time, from industrial growth to social development till date. Kumar AKS (2010) and Suryanarayana H.M and et al. (2011), prepared a HDI for seventeen states and inequality adjusted HDI among the states respectively following the same methodology of UNDP. A detailed study of whole dynamic and evolutionary process of development was done by Anjula T (2008) in her PhD work. Hanagodimath, S V (2008), examined the state wise impact of social sector expenditure on human development of India. Gupta Joyeeta and Vegelin Courtney (2016), published a paper including social development, social sector expenditure, economic growth with sustainable development and inclusive growth. But the limitation of the paper is absence of any empirical evidence. Fethi Amri, Mohamed Arouri and Fateh Bélaïd (2019), prepared a global framework on economic growth and environmental degradation taking empirical evidence for middle east and north America (MENA) and tested environment Kuznets Curve (EKC) and build a model for it. Gupta M. R. and Barman T. R. (2015) forwarded a dynamic two sector endogenous growth model for formal and informal sector with productive public expenditure and environmental pollution. Das B. (2020) have done an extensive work on social sector development both in terms of infrastructure and their attainment of districts of Assam.

IDENTIFICATION OF RESEARCH GAP:

Relationship between development and environment is critical. Many researchers studied it differently. Though necessity of studying environment in relation with development is not a new phenomenon, yet in constructing HDI, environmental parameters always keep it aside. Similar thing is happening in social development studies also. So, this study is on the long-term relationship of environmental degradation with economic growth.

OBJECTIVES OF THE STUDY:**General Aim:**

The general broad objectives of the proposed study are to link environment with development empirically.

Specific objectives:

The objective of this paper is to investigate the dynamics of the causal relationship between Economic Growth and environmental degradation in India for the period spanning from 1960 to 2018.

Hypotheses:

H₀: No causal relation between environmental degradation (CO₂E) and economic growth (GDP)

H₁: Causality between environmental degradation (CO₂ emission) and economic growth (GDP)

METHODOLOGY

Emission of greenhouse gases is one of the major sources of pollution in the world. The most well documented harmful effect of greenhouse gases is global warming. Of the five major greenhouse gases causing global warming carbon dioxide (CO2) is the most abundant. It is also the most popular among academicians and activists all over the world. Apart from the quantitative significance of its emissions and it’s potential to hurt humans there are other reasons for the attention that it gets. For example, the Kyoto protocol and the debates involving it have made CO2 a household topic.

Data will be collected from World Bank report, Reserve Bank of India Reports, central pollution control board, state pollution control board etc.

The time reference period will be from 1960 to 2018 for approximately sixty years.

The objective of this paper is to investigate the dynamics of the causal relationship between Economic Growth and environmental degradation in India for the period spanning from 1960 to 2018. This study uses annual data on variables – per capita Gross Domestic Product (PCGDP) which measures the overall economic growth of the country, and CO2 Emission (CO2E) and as proxy measures for environmental degradation (Wang and Godbey, 1994; Gunduz and Hatemi-J, 2005; Kim *et al*, 2006). The time-series data of PCGDP and CO2E variables first converting the raw data into returns R_t

$$R_t = \frac{P_t - P_{t-1}}{P_{t-1}} \times 100$$

R_t denotes the return at time t

P_{t-1} denotes Per capita GDP of base year

P_t denotes the Per Capita GDP at time t

RESULTS AND DISCUSSION

As an essential step of time series empirical analysis, it is first, required to determine the order of integration for each of the two variables used in the analysis. The Augmented Dickey-Fuller unit root test has been used for this purpose and the results of such test are reported in Table-1. And, it is clear that the null hypothesis of no unit roots for all the time series are rejected at their first differences since the ADF test statistic values are less than the critical values at 5% of significances. Thus, the variables are stationary and integrated of same order.

Table 1: Results of Augmented Dickey-Fuller Unit Root Test

variables	ADF Statistics	Critical Values	Decision
GDP	-2.63707	0.00850	Reject
CO2E	-2.63707	0.00850	reject

After confirming stationarity of the two series, the study proceeds to conduct co-integration test to ascertain that the variables are cointegrated.

Co-integration test:

Co-integration analysis is performed to investigate long term relationship between CO2 emission and economic growth. For this VAR based co-integration test, the methodology developed by Johansen (1988) and Johansen and Jesulius (1990) are deployed. It is involving two steps- “trace test” and “maximum Eigen value test”. The results of these tests are shown in Table-2. The Trace test indicates the existence of one cointegrating equation at 5% level of significance. And, the maximum eigenvalue test makes the confirmation of this result.

Table-2. Results of the cointegration test

Null hypothesis	Eigen values	Trace statistics	5% critical value (p value)
None	0.457137	50.9845	15.49471(0.00) *
At most 1	0.258825	16.77307	3.841465(0.00) *
* Implies rejection of the null hypothesis of no cointegration at 5% critical level			

The results of the cointegration tests shows that the null hypothesis of “no cointegration” is rejected using both trace test (λ_{trace}) and maximum Eigen-value test (λ_{max}). This means that the two variables are cointegrated. It suggests the presence of a long-term relationship between PCSDP and CO2E.

Granger Causality tests:

This study uses Granger Causality Test suggested by C. W. J. Granger (1969) for testing the causality between CO2 emission and economic growth in India, in the VAR framework. A time series, X, is said to Granger-cause another time series, Y, if using past values of X improves the prediction of current values of Y. This can be tested by running a regression of Y on past values of Y and X. The null and alternative hypotheses of the test are:

H₀: No causal relation between environmental degradation (CO2E) and economic growth (GDP)

H₁: Causality between environmental degradation (CO2 emission) and economic growth (GDP)

The above hypothesis is tested in the context of the VAR of the following form of bivariate linear auto-regressive model of variables

X_t(GDP) and Y_t(CO2E)

$$y_t = \sum_{i=1}^n \alpha_i x_{t-i} + \sum_{j=1}^n \beta_j y_{t-j} + u_{1t} \dots \dots \dots (1)$$

$$x_t = \sum_{i=1}^n \alpha_i x_{t-i} + \sum_{j=1}^n \beta_j y_{t-j} + u_{2t} \dots \dots \dots (2)$$

Where, it is assumed that the disturbances U_{1t} and U_{2t} are uncorrelated.

Table 3-Results of Granger Causality test

Lag	Null hypothesis CO2E to GDP	F statistics	Prob.	Results
1	GDP does not granger cause CO2E	3.26114	0.0765	Reject
	CO2E does not Granger cause GDP	0.00252	0.9601	Accept
2	GDP does not granger cause CO2E	2.56161	0.0895	Reject
	CO2E does not Granger cause GDP	0.41427	0.6630	Accept

The test result suggests in both the lag order of one and two as optimal lag based on Akaike information criterion the null hypothesis ‘GDP does not granger cause CO2E’ is rejected at 5% level of significance. But ‘CO2E does not granger cause GDP’ is accepted. Thus, the results suggest a unidirectional causal linkage between GDP and environmental degradation. The nature of the causal relation may be stated as ‘per capita GDP has Granger causes on CO2 emission.

CONCLUSIONS

The arrival of the COVID-19 pandemic provides a window of opportunity for a green recovery that can speed up decarbonization. In response to increasing concerns about the effect of anthropogenic greenhouse gases on global climate, international action has agreed to reduce emissions. Renewable resources are being explored with renewed obligations as a brilliant solution to be tapped for addressing challenges such as poverty and global warming. If the world is to develop sustainably, it has

been recognized that it is then necessary to secure access to affordable, reliable, sustainable, and modern energy services while reducing greenhouse gas emissions and the carbon footprint of the energy sector. That's why it is urgent to bring climatic indicators in the concept of human development or social development. That will preserve the earth for our future generation. For well-balanced analysis of development situation of a country, it becomes imperative to bring the Anthropocene needs of climate change for a greater understanding and course correction to the pathway to sustainability. We know that carbon pricing can be an effective and efficient policy measure for reducing carbon emissions.

Now our target is to make aware about this new era to the people and to choose in the face of uncertain futures to initiate a new journey which can enhance our freedoms and the planetary pressures also soften (Human Development Report, 2020). We have to rethink that rises of Covid-19 in this planet is a cautionary tale for human beings. Scientists have already been predicting about such like a pandemic, showing possibilities of rising new diseases which will transmit from animals and ultimately this became truth and we seem to be Covid-19 is like such a disease. All this have proved that we human being persistently putting pressures on the planet and as a result we suffer now. So, it is urgent to link development with environment protection for sustainability and the study transform the message to the people of India from Kasmir to Kanyakumari, from Gujrat to Arunachal.

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