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An Empirical Study of Economic Reforms and Environmental Hazards in India

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Abstract: ***In the last decade of 20th century, India marked a dramatic & momentous change in its economic policy shifting towards market economy. The objective of these reforms was to attain a higher growth. The prime objective of this study is to look into the effect of economic reforms on environment and to forecast the future level of degradation for India. The study also states the growth rate of economic development and environmental degradation for 207 countries. It was found that there had been a significant growth of economy & environmental degradation for all income groups and India. Also, growth had a positive and significant impact on degradation. The elasticity of this impact for India is more than one. Reforms also had an adverse impact on environment. The level of degradation is forecasted to be 27 times of 1998 level in 2020 & will be 39.75 million tons in 2032. The study suggests increase in forest cover, promotion of climate exchange, faster implementation of EURO IV norms and change in mindset of people towards public transport for sustainable development and environmental security.***

Keywords: Economic Reforms, Environment, Kuznet Curve, Carbon Emission, India.

I. INTRODUCTION

The last decade of the 20th Century marked a dramatic and momentous change in world economy. The old economic thinking on development changed and the world economy moved all the way to free trade through opening up of economies. In the year 1991, India also changed its process of development from 50 year old planning to more market oriented development. The policy change was in the form of LPG or liberalization, privatization and globalization. "The basic medium term objective of these policy reforms is to lay the foundation of sustained growth of output and employment in the context of increasing global competitiveness of the Indian economy" (Singh 1994). The statement of the current Prime Minister and then finance minister Dr. Manmohan Singh reveals the main motto of reforms to take economy to a higher growth trajectory. However, it is empirically proven that economic growth leads to environmental degradation. According to "Environmental transition hypothesis" or popularly known as "Environmental Kuznet Curve" (EKC), initially with economic growth, there occurs environmental degradation till per capita income reaches maximum point on Kuznet Curve (Kuznet 1955).

II. REVIEW OF LITERATURE

The adverse impact of economic activity on the environment had been a subject of much debate and controversy since the 1700's. The tone was set by Thomas Robert Malthus (1798), by setting a link between population growth and food production. Kuznet (1955) first set the relationship between economic growth and environment stating a U shaped relationship between economic growth (level of per capita income) and variety of indicators of environmental degradation. Charles Kolstad (2000) observed a higher rate of CO_2 emission in wealthier countries, which is further increasing with economic growth. SO_2 was found to be higher in low income countries. CO_2 emission thus is a major concerning indicator with economic development.

Therefore, many nations including US are considering polices to reduce CO_2 emissions (Jorgenson and Wilcoxen 1992). Greenhouse abatement policy issue was however initiated by Edmonds and Reilly (1983).

III. OBJECTIVES

In the light of the study of (Shafik and Bandyopadhay, 1992), taken as the base of 1992 world bank report and views of Herman Daly (1993) that environmentalist opposes free trade from the view point of market failure; along with the background given in introductory section, the objectives of study are: -

1. To analyze the growth rate of economic development and environmental degradation and find cause & effect relationship between them.
2. To study the impact of economic reforms on environment.
3. To forecast future emission levels

The study moves in the direction as section I, II and III introduces the topic, studies literature review and states the objectives of the study respectively, section IV deals with the research methodology & database. Section V states the results and discussions of the study. Lastly, section VI concludes the research and suggests certain measures for environmental up gradation.

IV. RESEARCH METHODOLOGY AND DATA SOURCE

The research involves the study of various books on environmental economics, periodic journals, financial dailies and several websites. The data used is of secondary nature, collected from World Development Indicators. Growth rate of GDP & CO_2 emissions covering period from 1960-2010 for 207 countries classified in various income groups by world bank were estimated by model: -

$$\ln Y_t = B_o + B_1 X_{1t} + B_2 X_{2t}^2 + U_t$$

Where Y_t is dependent variable and X_1 & X_2 are time and it's square respectively.

The cause and effect relationship between environmental degradation and economic growth was analysed through log – linear model: -

$$\ln Y_t = a + b_1 \ln X_1 + b_2 \ln T + U_t$$

Where $Y_t = Co_2$ emissions, X_1 is GDP and T is time (Proxy for other factors).

Multiple regression models were used to find impact of new economic reforms on environment in India for the period 1990-2010: -

$$Y_t = a + b_1 X_{1t} + b_2 X_{2t} + U_t$$

Where Y_t = Index of Co_2 emissions, X_{1t} = Index of Industrial value addition, X_{2t} = No. of vehicles per thousand people. However, forecasting of CO_2 emission for period from 2011 to 2032 was based on growth rate model mentioned above.

V. RESULTS AND DISCUSSION

Significant economic development had been observed all over the world after Second World War. Also severe climatic changes were experienced in the second half of the last century. Table-1 shows the growth rate of GDP and CO_2 emissions. It can be observed that all the income groups witnessed a significant growth rate of economy. On an average the world economy had grown by 5.51%, with higher income, upper middle and lower middle income countries expressing the growth rate of 5.31%, 7.18% and 7.089% respectively. Low income countries witnessed lowest growth among all of 4.49%. However rate of growth of growth rate is significantly falling in all income groups.

TABLE-1
Compounded Annual Growth Rate & Rate of Growth of Growth Rate

No.	Income Group Countries	GDP		CO_2 Emissions	
		Growth Rate	RGGR	Growth Rate	RGGR
1	World	5.51*	-0.044*	3.90*	-0.016
2	Higher Income	5.31*	-0.043*	3.43*	-0.038*
3	Upper Middle	7.18*	-0.062*	6.83*	-0.059*
4	Lower Middle	7.089*	-0.057*	5.94*	0.005
5	Low Income	4.49*	-0.011*	7.00*	0.002
6	India	4.23*	0.051*	4.429*	0.037*

Note:- * Significant at 1% level of significance

India on the other hand had average economic growth rate of 4.23% with RGGR as 0.051%. On the other hand CO2 emissions in the world had grown significantly at a constant rate of 3.9% p.a.. Higher income countries and upper middle income countries had CO2 growth of 3.43% & 6.83% respectively with falling RGGR. This reflects the implementation of various environmental pacts like Stockholm and Rio de Janeiro earth summit along with Kyoto protocol. Lower income and low income countries including India are observing rising CO2 emissions as stated by Kuznet Curve.

TABLE-2
Estimated Regression Equation for Model:-
$\ln Yt = a + b1 \ln Xt + b2 \ln T + Ut$

No	Income groups	Constant	Coefficient of X_1	Coefficient of X_2	$\bar{R}^2$
1	World	-14.549*	1.019*	-0.064*	0.968
		(2.621)	(0.089)	(0.042)	
2	Higher Income	5.892*	0.321*	0.106*	0.929
	Countries	(2.54)	(0.087)	(0.039)	
3	Upper Middle Income	-12.328*	0.947*	0.006	0.996
	Countries	(0.786)	(0.029)	(0.017)	
4	Lower Middle Income	-33.825*	1.778*	-0.299*	0.962
	Countries	(3.306)	(0.126)	(0.075)	
5	Low Income	31.0107*	1.644*	0.044	0.974
	Countries	(2.878)	(0.112)	(0.057)	
6	India	-19.587*	1.244*	0.069*	0.992
		(0.946)	(0.0386)	(0.021)	

Note:- Values in Bracket are Standard Error
*** Significant at 1% level of significance**

Table-2 shows marginal impact of economic development on environment. All 207 countries are experiencing a positive and significant impact of growth on environment. The economic elasticity of environment is more than one for India, which reflects the concern for environment. Even this concern gets support on suitable grounds while analyzing impact of economic reforms on environment. It is clear from table 3 that both the factors of economic reforms, industrial output & No. of vehicles are resulting in a severe rise of CO2 emissions. Most importantly rise of automobiles is causing serious concerns.

TABLE-3
Estimated Regression Equation for Model:-
$Yt = a+b1X1t+b2X2t+Ut$

Dependent Variable	Constant	Coefficient of X_1	Coefficient of X_2	$\bar{R}^2$
Co_2 Emissions	19.279* (5.119)	0.548* (0.116)	6.515* (2.091)	0.9838

Note:- Values in Bracket are Standard Error
*** Significant at 1% level of significance**

India is progressing fast towards being a developed country reflecting a substantial development in future. In the backdrop of impact of 1991 development policies on environment, the forecast had been made for CO2 emission reflected in Figure 1. The period is witnessing many policies for upliftment of environment like introduction of Euro III & IV norms, National Auto Fuel Policy 2003, New Delhi declaration on climate change, but yet the present level and forecast are reflecting a horrible scenario. CO2 emission level is going to be 27 times of 1998 level in 2020; reaching 39.75 million Kilo tons in 2032 registering a rise of 211.84 % to last recorded level of year 2010.

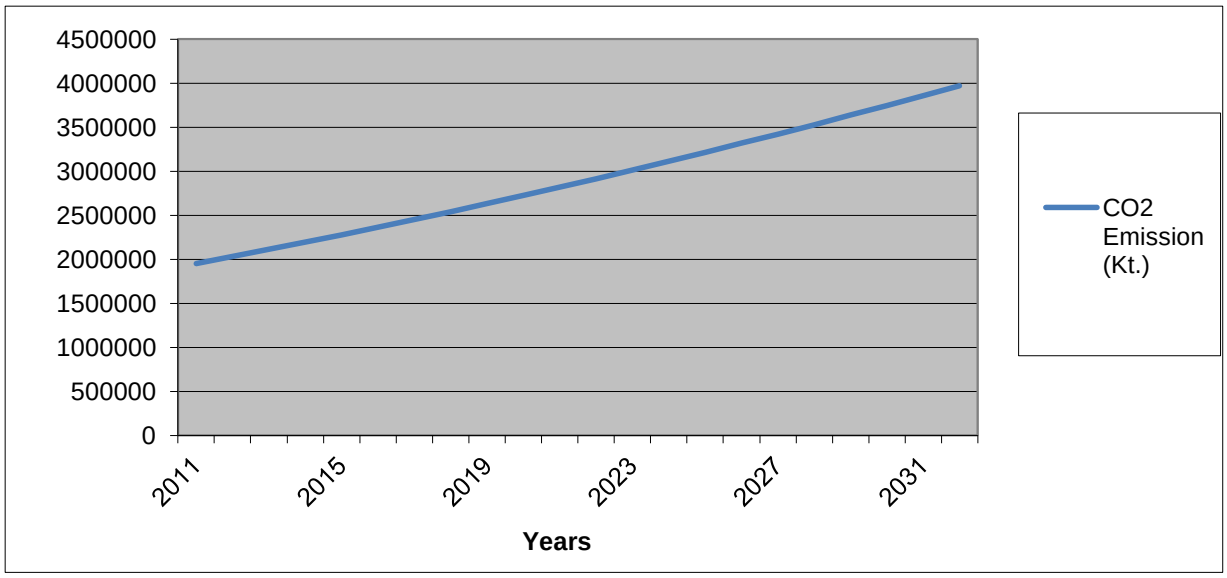

Fig. 1 Forecasted CO2 Emission

VI. Conclusion

It can be concluded that India is witnessing tremendous economic growth apart from being on first or rising phase of Kuznet Curve. The development is drastically degrading environment. Even new economic reforms also had black impact on natural beauty. The future of environment depends on certain concrete steps like opening of climatic exchange, raising of forest cover, stricter Auto fuel policy and limit to growth otherwise the future generations will witness a environmental less growth.

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