

CLEAN ENERGY

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Abstract: *Clean energy for any country is that where no negative effect on environment. So, environmentally efficient and friendly technique is assumed as clean energy. Renewable energy is friendly for environment and it also helps to fulfill demand of energy. The 7th sustainable development goal is affordable and clean energy. So, to achieve this objective the relationship between clean energy and environment is tried to study in this paper. The paper conducted study on data from 2008 to 2018. To test impact or statistical relationship between clean energy and CO2 Emission per capita, regression analysis technique has been used. The study showed that there is significant impact of CO2 emission per capita on clean energy. The study suggested for more clean energy projects and such policies which may increase consumption of clean energy.*

Keywords: Clean Energy, CO2 emission per capita, Impact.

1. INTRODUCTION

India's installed capacity generation from clean energy sources is 35.86% as on 31 March 2020. India is on 4th position in consumption of energy in globe which is due to increase in standard of living and population (Wikipedia). Sustainable energy provides energy efficiency more usage of energy and also energy security. (Lund, 2006). Clean energy for any country is that where no negative effect on environment. So, environmentally efficient and friendly technique is assumed as clean energy. Renewable energy is friendly for environment and it also helps to fulfill demand of energy. The 7th sustainable development goal is affordable and clean energy. It is challenge to provide affordable and clean energy so that objective can be achieved. Renewable energy provides more energy which is not harmful for environment. Renewable sources for this purpose can be used more such as solar, wind, hydro, bio etc. the study. The paper conducted study on data from 2008 to 2018. To test impact or statistical relationship between clean energy and CO2 Emission per capita, regression analysis technique has been used. India produced large output from renewable sources. So, this paper studied relationship between clean energy and environment of India.

2. REVIEW OF LITERATURE

Bölük, G.& Mert, M. (2015) study the relationship between CO2 emission, electricity generation and GDP from 1961 to 2010. The study was conducted on variables of Turkey. Autoregressive distributive lag (ARDL) was applied to test relationship. Environment Kuznets curve hypotheses was also studied. The study concluded negative association between renewable energy sources and CO2 in long run which means that renewable energy is favorable source for environment in long run. GHG emission and per

capita GDP was also studied. There was negative relationship between GHG emission and per capita GDP.

Jebli, M. B & Youssef, S. B. (2015) found negative impact on CO₂ emission in long run in Tunisia. The paper study relationship between CO₂ emission, GDP, renewable and nonrenewable energy consumption and international trade through data from 1980 to 2009. Statistical techniques VECM and ARDL were applied. Environment Kuznets curve hypothesis did not provide favorable in long run in this study. So, study recommended reforms in subsidy system, location of ports for international trade and renewable energy projects.

Aruga, K. (2019) investigated energy environment Kuznets curve (EEKC) in 19 countries in 1984 to 2014. Hypothesis was tested for different income groups- high, middle and low. Pooled OLS, fixed and random effects model for panel regression. Panel regression model include Wald test, LM test and Hausmen test. Cointegration test was also applied. Variables of high-income model were not strongly cointegrated with hypotheses. The study showed that hypotheses are favorable only for high income group not for middle- and low-income group. The study suggested energy policies and cooperation with developed countries for sustainable development.

Jebli, M. B. (2015) study long and short run relationship between renewable energy consumption, CO₂ emission, GDP, and international trade by using statistical techniques such as co integration, granger casualty test. The study used data from 1980 to 2010 of 24 sub Saharan African countries. The study showed indirect short run causality between emission, Renewable energy and GDP. Environment Kuznets curve hypothesis was not favorable in long run. The study showed positive relation between Exports and CO₁ emission and negative relation between imports and CO₂ emission. The study suggested more focus on technology transfer to increase renewable consumption and reduce CO₂ emission.

3. RESEARCH METHODOLOGY

This part of study included objectives to be achieved through study, data collection sources, techniques for testing and limitations of the study.

3.1 Objectives of the study

- To study clean energy profile in India.
- To study CO₂ per capita emission in India.
- The study statistical relationship between both clean energy and CO₂ emission per capita.

3.2 Sources of data collection

The data for study has been collected from World Bank, international energy agency and various other research papers and journals. Renewable energy is taken as clean energy. The study was conducted on period from 2008 to 2018 of India. Clean energy data of 2016, 2017 and 2018 was not available so average value of previous years' available data was used. CO₂ emission per capita was also not available for 2018. So average was also used for this value. Averaged values are kept in bold form in table.

3.3 Techniques

The study used tabular form to show data from 2008 to 2018. It used regression analysis to study statistical relationship between clean energy and CO₂ emission per capita.

3.4 Limitations of the study

The study used historical data for calculation. So previous years' deficiencies can affect results.

Percentage of nonrenewable energy was calculated by researcher which was based on clean energy data. Time and cost are also main constraint for study. When data is not available, the study average value which may also affect results of the study.

4. ANALYSIS AND INTERPRETATION

This part of study analyzed and interprets clean energy and CO2 Emission per capita and their statistical relationship.

4.1 Clean energy

Table 1. Clean Energy

Year	Percentage of Nonrenewable energy*	Percentage of Clean energy ¹	CO2 emission per capita ²
2008	56.37	43.63	1.1
2009	59.23	40.77	1.2
2010	60.52	39.48	1.3
2011	61.07	38.93	1.3
2012	61.61	38.39	1.4
2013	62.15	37.85	1.5
2014	63.35	36.65	1.6
2015	63.98	36.02	1.6
2016	61.03	38.97	1.6
2017	61.03	38.97	1.6
2018	61.03	38.97	1.4

*Calculated by Researcher

¹Source: World Bank

²Source: International Energy Agency

Note: Bold data in table is based on average value of previous years due to unavailability of data.

4.2 Relationship between CO2 per capita and clean energy relationship

H_{01} : There is no significant impact of CO2 emission per capita on clean energy.

Model	Variables Entered/Removed ^a		Method
	Variables Entered	Variables Removed	
1	COEMISSIO NPCAPITA ^b	.	Enter

a. Dependent Variable: CLEANENERGY

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.826 ^a	.682	.647	1.20193

a. Predictors: (Constant), COEMISSIONPCAPITA

ANOVA ^a						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	27.908	1	27.908	19.318	.002 ^b
	Residual	13.002	9	1.445		
	Total	40.910	10			

a. Dependent Variable: CLEANENERGY

b. Predictors: (Constant), COEMISSIONPCAPITA

Coefficients ^a						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	52.287	3.052		17.132	.000
	COEMISSIONPCAPITA	-9.392	2.137	-.826	-4.395	.002

a. Dependent Variable: CLEANENERGY

The study indicated that there was 68% proportion of variance in CO2 emission per capita. There was high correlation between these two variables at 0.826. Beta value is 9.392 which stated negative association between variables that indicated that every one increase in CO2 emission per capita, clean energy decreased by 9.392. The P value is 0.02 so associations between clean energy and CO2 emission per capita is statistically significant @ 5%. H_{01} is rejected, which states that there is significant impact of CO2 emission per capita on clean energy.

5. FINDINGS AND SUGGESTIONS

This part of study showed findings and suggestions for clean energy and environment according to results.

5.1 Findings

Clean energy percentage is decreasing every year which is not favorable for growth of any country.

Impact of clean energy on environment in form of CO2 emission per capita is favorable.

The study showed that there is statistical impact of CO2 emission per capita on clean energy.

5.2 Suggestions

Such type of policies must be ensured so that percentage of clean energy can be increased in India.

Clean energy projects should must so that demand of energy can be fulfilled through renewable energy sources.

CONCLUSION

At last, the study concluded that clean energy percentage is not favorable for economy. But statistical relationship of clean energy and CO2 Emission per capita is favorable. The relationship was 0.826 so these variables are correlated with each other and alternative hypotheses that there is significant impact of CO2 emission per capita on clean energy in India. The study suggested such policies which can increase clean energy projects and can retain positive relation with environment.

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