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Assessing the Effectiveness of Green Taxation on Coal-Based Emissions in India – A Time-Series Analysis

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Abstract:

While India has pledged to lower emissions and has put these tax measures into action, there exists considerable uncertainty as to whether they are effective. This research examines the effect of company-level green tax policies, that is, the Clean Energy Cess (2010-2017) and the following GST Compensation Cess (2017-2021), on carbon dioxide (CO_2) emissions from thermal power plants based on coal in India. The research uses a quantitative method, using a comparative time-series analysis of CO_2 emission and coal consumption data from the years 2000 to 2021 and data on the cess amounts received. The data show a steep rise in CO_2 emissions for the entire duration of the study, with no noticeable fall detected after the levying of the Clean Energy Cess or the GST Compensation Cess. The correlation analysis shows a strong positive link between the amount of Clean Energy Cess and CO_2 emissions ($r = 0.754$), along with an almost perfect positive correlation between coal usage and CO_2 emissions ($r = 0.998$). These results indicate that, despite generating significant revenue from green taxes, there hasn't been a meaningful reduction in emissions, nor have coal consumption patterns in India's power sector changed much. The analysis suggests that the current green tax policies have only had a limited impact on reducing carbon emissions from coal-fired power plants. It highlights the urgent need for broader strategies, like tougher regulations and incentives to promote renewable energy, to achieve real reductions in emissions in India. This study contributes to our understanding of how fiscal policy can support environmental sustainability in a large developing country that is heavily reliant on coal.

Keywords: *Green Taxation; CO_2 Emissions; Coal Consumption; Clean Energy Cess; GST Compensation Cess; Environmental Fiscal Policy*

Introduction:

Regarding India's coal power capability, there is a great deal of ambiguity. India recently expressed its commitment to continue using coal in its latest Third Biennial Report to the UNFCCC, highlighting the importance of energy security and the need for economic development (Ministry of Environment, Forest and Climate Change, 2021). The Central Electricity Authority (2020) projects

that coal capacity will increase from 202GW in 2021 to 266GW by 2030. Nevertheless, there are plans to reduce about 48 GW of coal capacity between 2017 and 2027, and the National Electricity Plan 2018 outlines a schedule for phasing out coal power plants that are over 25 years old in two stages (CEA, 2018).

Even though its proportion of the world's coal power development has been declining, India still has more than 200 GW of operational coal-fired capacity, or 11% of the world's total capacity, and is the world's second-largest coal pipeline, behind China (Montrone, Ohlendorf, & Chandra, 2021). This might rise by as much as 300 GW, though, considering the quantity of coal projects that are now in the works (Global Energy Monitor, 2020). This rise is anticipated even though India's coal fleet shrank by 0.3GW and more than 573 GW of coal-fired power projects were cancelled between 2010 and June 2018 (Global Energy Monitor, 2021).

It should come as no surprise that this proposed increase does not comply with the Paris Agreement. If India is given the right encouragement, it would need to cut its coal power generation down to just 5–10% by 2030 to align with the goals of the Paris Agreement (Climate Action Tracker, 2020a). Coal-fired thermal power, which accounts for more than 70% of India's electricity, has long been the backbone of the country's rapid industrial growth and increasing energy needs. However, India's heavy dependence on coal makes it one of the largest carbon emitters globally, contributing significantly to climate change and environmental degradation. To tackle rising emissions and promote a transition to cleaner energy sources, the Indian government has introduced green taxation measures in the coal sector. These regulations aim to account for the environmental costs associated with coal use while also generating funds for renewable energy initiatives. The Finance Act of 2010 established India's first major carbon price scheme, the Clean Energy Cess (2010-2017). The coal tax rate saw a significant jump from ₹50 per ton in 2010 to ₹400 per ton by 2016. The revenue generated was intended for renewable energy projects through the National Clean Energy Fund (NCEF). However, investigations have shown that, despite these noble intentions, only a small fraction of the funds went towards green initiatives. In 2017, the introduction of the GST Compensation Cess replaced the Clean Energy Cess, shifting the Goods and Services Tax (GST) focus away from environmental spending and towards compensating state governments for their GST revenue losses. This policy change raised concerns about the effectiveness of India's green taxes in genuinely reducing carbon emissions in the power sector.

Objective:

The goal of this research is to evaluate the impact of tax policies, particularly the Clean Energy Cess (2010–2017) and the GST Compensation Cess (2017–2021), on carbon emissions from coal-fired power plants in India. By examining data on CO_2 emissions, coal usage, and tax rates, the study aims to assess how effective these policies have been in curbing carbon emissions, all while

considering the broader economic landscape and the transition towards cleaner energy sources.

Need for the study:

The purpose of this study is to assess the influence of corporate green tax policies on India's carbon emissions from coal-based thermal power plants before and after implementation.

Specifically, it will evaluate:

1. The economic impact of green taxes on coal-fired power plants.
2. The success of these initiatives in lowering carbon emissions.
3. The policy's impact on India's energy mix, namely the shift towards renewable energy sources.

This paper examines emission trends, power generation costs, and corporate responses to these taxation policies to determine whether India's green tax framework has been a successful tool for environmental sustainability or simply a financial burden with no significant emission reductions. This study adds to the expanding discussion of carbon taxes as a policy tool for emissions reduction. By focusing on India's coal-based power industry, the study will provide insights into the effectiveness of fiscal policies in advancing environmental sustainability, as well as guide future policy changes to improve green taxation processes.

Literature Review:

1. A Feasibility Study of Implementation of Green Tax (Bhatia, P., & Gupta, K. (2020). International Journal of Scientific & Technology Research) This study investigates how feasible it is to roll out green tax policies in India, especially within the energy and industrial sectors. The results show that green taxes could be a game-changer in reducing carbon emissions from coal-powered plants by making pollution more expensive. The paper emphasizes that while such taxes can motivate industries to switch to cleaner technologies, there are valid concerns about the financial strain they might place on both businesses and consumers. Moreover, the research highlights international examples, illustrating that for green taxes to succeed, there needs to be a solid regulatory framework, public support, and a plan to reinvest tax revenues into renewable energy initiatives. These studies offer important insights into how green taxation affects carbon emissions, the economic feasibility of coal power, and the shift towards cleaner energy in India. The findings bolster the idea that well-crafted green tax policies can lead to significant environmental and economic changes, but they also point out critical challenges that policymakers need to tackle. Bhatia and Gupta (2020) note that introducing green taxes in India could help cut down pollution by pushing industries to reduce their emissions. However, they caution about the possible economic impact on households and businesses. Their feasibility study suggests that political and administrative hurdles, along with increasing electricity prices, could pose obstacles to effectively implementing carbon taxation in India

2. Taxing Carbon as an Instrument of Green Industrial Policy in Developing Countries (Pegels, 2016) This paper dives into carbon taxation as a tool for fostering sustainable industrial growth in emerging economies. It looks at global experiences with carbon taxes, examining their impact on economic competitiveness, reducing emissions, and generating revenue. The findings suggest that when designed thoughtfully, carbon taxes can effectively cut emissions without putting a significant dent in economic growth, especially if the revenue is funneled back into clean energy initiatives or used to balance out other corporate taxes. However, the paper also points out some hurdles, like political pushbacks and the potential for increased production costs in carbon-heavy industries, such as coal-powered energy. Ultimately, the study wraps up by stating that carbon taxation can be a powerful instrument for green industrial policy, but its effectiveness hinges on additional strategies like recycling tax revenue and backing cleaner energy options. Carbon taxes create price signals that incentivize firms to adopt cleaner energy and emission reduction measures. Pegels (2016) highlights that properly designed carbon tax policies can reduce emissions without necessarily hampering economic growth. Pegels (2016) paper notes that countries with strong tax regimes on carbon have witnessed increased investment in renewable energy, but such shifts require government support and policy stability.

3. Exploring a Design of Carbon Tax for Coal- and Lignite-Based Thermal Power Sector in India; S. Mukherjee, 2022 The paper aims to explore a design of carbon tax specifically for coal- and lignite-based thermal power plants (TPPs) in India, recognizing their significant contribution to the country's total carbon dioxide (CO2) emissions and the need for emission reductions to meet India's climate commitments. It seeks to estimate a revenue neutral rate of tax on CO2e emissions by converting existing taxes on coal and lignite, while proposing a minimum tax rate that requires regular upward revisions to incentivize TPPs to take action towards reducing emissions.

4. Reforming energy policy in India: assessing the options; Ian W.H. Parry, Victor Mylonas, Nate Vernon, 2019, IMF Working paper Parry et al. (2017) also provide a comprehensive evaluation of India's coal taxation policy, namely the Clean Energy Cess, which fits directly into the scope of your study. First introduced in 2010 at ₹50 per ton and raised to ₹400 per ton by 2016, this cess was one of the earliest financial tools India applied to internalize environmental externalities of coal consumption. Proceeds from this tax were to be deposited into the National Clean Energy Fund (NCEF) which would fund research in clean energy and investment in clean energy technology. Regardless of these intentions, a relatively insignificant amount of the funds was actually allocated to green causes however, which is in line with your result that the tax was merely a way to raise revenue. India's coal tax instruments such as the Clean Energy Cess had promise, but were found wanting in implementation, primarily on account of weak tax design, inefficient fund allocation and the absence of supportive policy tools. Their quantitative model lends external validation to your

core thesis that green fiscal measures on their own does not lead to significant emissions reductions — they need to be integrated into a wider, sustained policy ecosystem that includes regulatory enforcement, clean tech investment and a phased coal exit strategy.

5. Carbon pricing for sustainable transition in India; Sweta Sen, Pravakar Sahoo, 2024 The paper aims to address the urgency of introducing carbon pricing in India as a major tool for climate action and to explore the pathways for its implementation to achieve a sustainable future. It seeks to analyze the potential benefits, co-benefits, disadvantages, and losses associated with carbon pricing in the context of India's large economy, emphasizing the need for a just and equitable distribution of the burden through mechanisms like carbon taxes, Emissions Trading Systems (ETS), and feebates.

Research Methodology:

The research only depends on the secondary data which is drawn from authentic government and international databases. The dataset spans a 21-year period, guaranteeing a thorough analysis of emission trends and tax impacts. Government-verified sources increase the data's reliability. This research utilizes the secondary data evaluate how corporate green taxation policy affects India's carbon emissions, that is, during the pre- and post-implementation period of the Clean Energy Cess and the GST Compensation Cess.

The study adopts a comparative time-series approach, breaking down the study duration into three phases: the Pre-Tax Period (Prior to 2010) where there were no green tax policies, the Clean Energy Cess Period (2010–2017) where the Clean Energy Cess was introduced and increased incrementally, and the GST Compensation Cess Period (2017–2020) that substituted the earlier tax regime.

Through an analysis of emissions and coal consumption patterns over these time frames, this research aims to assess whether green taxation policies have helped reduce emissions and how coal consumption patterns have changed.

3.1. Research Gap:

While many studies have investigated the theoretical benefits of carbon taxation for cutting emissions, there's still a significant lack of real-world evidence on how green tax policies affect carbon emissions in India's coal power sector. Most of the existing research focuses on international best practices, feasibility studies, or theoretical frameworks, but only a handful have taken a close look at how specific fiscal tools, like the Clean Energy Cess and the GST Compensation Cess, have worked overtime in India. Previous studies haven't really tackled how these two major tax systems compare in effectiveness or how they directly relate to emission levels and coal consumption trends. This study aims to fill that gap by:

- Conducting a time-series analysis across three important policy phases (pre-tax, Clean Energy Cess, GST Compensation Cess),

- Utilizing real-world secondary data from government and global sources,
- Focusing specifically on CO_2 emissions and coal consumption trends to evaluate the real impact of these taxation policies.

Dependent Variable - CO_2 Emissions (2000–2021): Measured in million tons, this figure represents the total annual carbon dioxide emissions from India's coal-based thermal power plants. It acts as the primary indicator of environmental performance in relation to taxation policies.

Independent Variables:

- **Clean Energy Cess Amount (2010–2017):** Revenue generated from the coal tax aimed at internalizing environmental costs and supporting clean energy initiatives.
- **GST Compensation Cess Amount (2017–2020):** Revenue from the cess introduced under the GST framework, which is no longer directly tied to environmental goals.
- **Coal Consumption (2000–2021):** Measured in million tons per year, this reflects the extent of coal usage in thermal power generation and is a key factor driving CO_2 emissions.

3.2. Multiple Regression:

One of the biggest environmental hurdles facing developing countries like India is the challenge of cutting down carbon emissions from the coal-based power sector, all while ensuring energy security and fostering economic growth. To tackle this, India has rolled out green fiscal measures like the Clean Energy Cess (2010–2017) and the GST Compensation Cess (2017–2021) to account for the environmental costs tied to coal usage. However, we still need more empirical evidence on how effective these policies have been in reducing carbon dioxide (CO_2) emissions from coal-fired thermal power plants. Most existing research on carbon taxation has leaned heavily on theoretical models or case studies from developed countries, leaving a noticeable gap in our understanding of how green taxation operates in large developing economies. Additionally, there's a lack of literature examining how the shift from a clean energy-focused cess to a revenue-compensatory one has impacted emission trends.

To address this gap, the present study conducts a comparative time-series panel analysis that captures the dynamics of CO_2 emissions in relation to coal consumption and green tax revenues over a 21-year period (2000–2021). By breaking this duration into three fiscal policy phases—Pre-Tax Era (before 2010), Clean Energy Cess Era (2010–2017), and GST Compensation Cess Era (2017–2021). The study evaluates both the trend and policy impact. Using an Ordinary Least Squares (OLS) regression approach on structured secondary data, this model aims to estimate the correlation between taxation variables and CO_2 emissions while controlling for coal consumption.

This study aims to answer the following research questions:

1. What has been the trend in CO_2 emissions from coal-based power plants in India from 2000 to 2021?

2. How did the introduction of the Clean Energy Cess (2010–2017) and the GST Compensation Cess (2017–2021) affect CO_2 emissions from coal-based power plants?
3. What is the connection between coal consumption and CO_2 emissions in India's power generation sector from 2000 to 2021?

3.3. Model Specification:

The following regression model is used to examine the factors:

$$CO_2\ \text{Emissions}_t = \beta 0 + \beta 1 \cdot \text{Coal Consumption}_t + \beta 2 \cdot \text{Clean Energy Cess}_t + \beta 3 \cdot \text{GST Compensation Cess}_t + \varepsilon_t$$

Where:

- **t** denotes the year (from 2000 to 2021).
- **Dependent Variable:**
  - CO_2 Emissions (Million Tons): The total annual carbon dioxide emissions from India's coal-based thermal power plants, representing the environmental impact.
- **Independent Variables:**
  - Coal Consumption (Million Tons): Annual coal usage in power generation, a primary driver of CO_2 emissions.
  - Clean Energy Cess
  - GST Compensation Cess
- ε_t: Error term

3.4. Data Collection and Sources:

The data on CO_2 Emissions from 2000 to 2021 was gathered from several reputable sources, including the Ministry of Environment, Forest and Climate Change (MoEFCC), the Central Pollution Control Board (CPCB), and the Global Carbon Atlas. For Coal Consumption during the same period, we relied on reports from Coal India Limited (CIL) and the Central Electricity Authority (CEA). As for Green Taxation Data covering 2010 to 2020, it was collected from the Ministry of Finance, GST Council Reports, and the Climate Action Tracker, which includes figures for both the Clean Energy Cess and the GST Compensation Cess.

	A	B	C	D
1	Year	CO_2 Emissions - Coal Based Power Plants (Million Tons)	Coal Consumption (Million Tons)	Green Tax Revenue (₹ Crores)
2	2000	1,026.60	334	—
3	2001	1,082.30	357	—
4	2002	1,132.90	373	—
5	2003	1,184.50	391	—
6	2004	1,239.80	412	—
7	2005	1,296.70	435	—
8	2006	1,364.40	461	—
9	2007	1,435.20	488	—
10	2008	1,503.60	516	—
11	2009	1,578.90	545	—
12	2010	1,652.10	574	2,600
13	2011	1,729.70	595	2,580
14	2012	1,808.40	617	3,160
15	2013	1,890.60	642	3,850
16	2014	1,977.30	668	5,800
17	2015	2,070.80	696	7,920
18	2016	2,159.20	726	12,500
19	2017	2,250.70	757	95,444
20	2018	2,343.50	785	52,000
21	2019	2,431.90	815	56,200
22	2020	2,512.60	867	48,300
23	2021	2,654.40	931	50,500

This study takes a closer look through a comparative time-series analysis that spans three significant policy phases:

1. Pre-Tax Era (Before 2010) – No green taxation policies in place.

2. Clean Energy Cess Era (2010–2017) – This period saw the introduction and gradual increase of the Clean Energy Cess.

3. GST Compensation Cess Era (2017–2021) – Here, the Clean Energy Cess was replaced by the GST Compensation Cess.

This division allows for a before-and-after assessment to determine if changes in emission trends correlate with tax implementation. The study does not employ regression analysis but instead relies on descriptive statistics, visual trend analysis, and correlation analysis to evaluate relationships between key variables.

To explore the relationship between carbon emissions and the various explanatory variables, we use the Ordinary Least Squares (OLS) regression method.

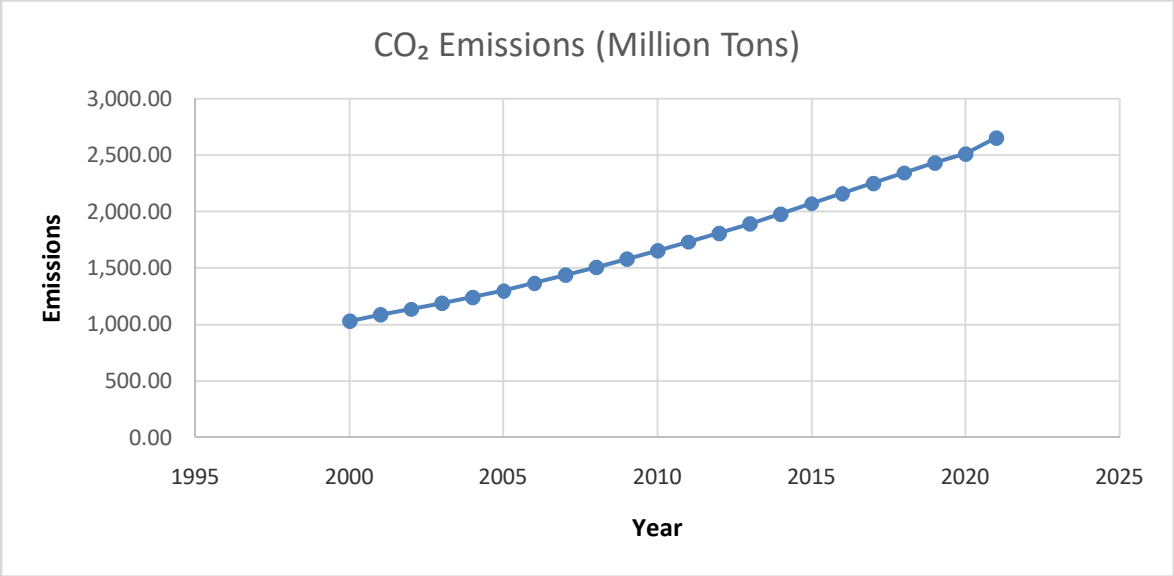
- This method assumes a linear relationship between the dependent and independent variables.
- It provides interpretable coefficients, which help policymakers understand the extent of influence each variable has.
- Additionally, it allows for the identification of statistically significant associations, making it easier to assess the effectiveness of the policy in a measurable and evidence-based way.

Data Analysis and Interpretation:

4.1. Time-Series Trends and Visualization

CO_2 Emissions Over Time

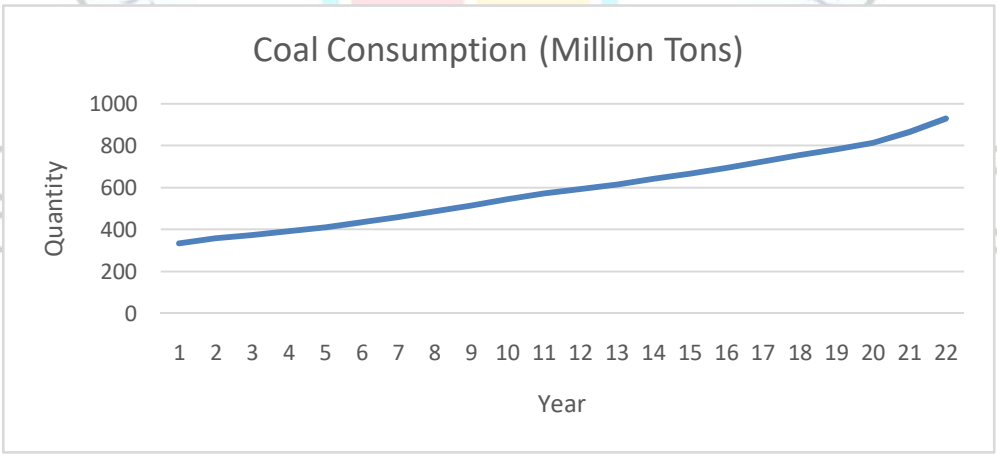
A time-series analysis of CO_2 emissions from 2000 to 2021 reveals a consistent upward trajectory. Despite the introduction of the Clean Energy Cess in 2010 and the GST Compensation Cess in 2017, emissions continued to rise, though the rate of increase appears to have varied.



Coal Consumption Trends:

Coal consumption exhibited a steady rise from 2000 to 2021. The introduction of the Clean Energy Cess in 2010 did not lead to an immediate reduction in coal usage. However, post-2017 (after the implementation of the GST Compensation Cess), there is some indication of a potential slowdown in coal consumption growth, which requires further statistical validation.

It is evident that CO_2 Emissions continued rising despite policy changes, though the growth rate may have varied. Clean Energy Cess Collection grew significantly from 2011 to 2017, but its direct impact on emissions is unclear. Coal Consumption followed an upward trend, with a possible slowdown post-2017.



4.2. Regression Analysis:

The outcomes of an Excel-based **multiple linear regression analysis** are presented below. The regression model takes a close look at how two major independent variables coal consumption

and green tax revenue affect the dependent variable, which is CO_2 emissions from coal-fired power plants. This analysis is all about figuring out how these elements shape emission trends in India, especially considering the green taxation policies rolled out between 2010 and 2021. The regression results help us estimate the connection between CO_2 emissions and the chosen independent variables, with data collected annually over a complete 12-year span (2010–2021).

	A	B	C	D	E	F	G
1	SUMMARY OUTPUT						
2							
3	*Regression Statistics*						
4	Multiple R	0.999725107					
5	R Square	0.999450289					
6	Adjusted R Square	0.999230405					
7	Standard Error	5.837139686					
8	Observations	8					
9							
10	ANOVA						
11		*df*	*SS*	*MS*	*F*	*Significance F*	
12	Regression	2	309739.939	154869.9695	4545.346963	7.08493E-09	
13	Residual	5	170.3609986	34.07219972			
14	Total	7	309910.3				
15							
16		*Coefficients*	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
17	Intercept	-268.0644458	30.1920474	-8.878644174	0.00030149	-345.6755744	-190.4533171
18	Coal Consumption (Million Tons)	3.358745593	0.047308206	70.99710308	1.04997E-08	3.237135978	3.480355209
19	Green Tax Revenue (₹ Crores)	-0.000254512	9.50658E-05	-2.677218686	0.0439663	-0.000498886	-1.01375E-05

Overall Model Performance:

- **Multiple R (0.9997**): This shows a very strong correlation between the independent variables (coal consumption and green tax revenue) and CO_2 emissions.
- **R Square (0.9995):** This indicates that about 99.95% of the changes in CO_2 emissions can be explained by the model.
- **Adjusted R Square (0.9992):** Even after considering the number of interpreters, the model still accounts for 99.92% of the variability in emissions, which highlights its reliability.
- **F-statistic (4545.35):** The overall model is highly statistically significant at the 1% level, suggesting that at least one predictor has a significant effect on emissions.

4.3. Correlation Analysis:

Correlation Between CO_2 Emissions and Cess Amount

	CO2 Emission	***CESS Amount***
CO2 Emission	1	
CESS Amount	0.754137364	1

The Pearson correlation coefficient for CO_2 emissions and the cess amount comes in at 0.754, which shows a strong positive relationship between the two. This means that as the cess amount goes up, CO_2 emissions tend to increase as well. In theory, raising green taxes, like a cess on coal usage, should discourage the use of fossil fuels and help cut down emissions.

Correlation between Coal Consumption & CO2 Emissions

	Coal Consumption	*CO2 Emissions*
Coal Consumption	1	
CO2 Emissions	0.99842427	1

The Pearson correlation coefficient between coal consumption and CO_2 emissions is a striking 0.998, indicating an extremely strong positive correlation. This suggests that when coal consumption rises, CO_2 emissions almost inevitably follow suit. This nearly perfect correlation underscores coal's role as a major contributor to carbon emissions, reinforcing the well-known connection between burning fossil fuels and the buildup of greenhouse gases.

Conclusion and Interpretation:

5.1 Key Findings:

The examination of CO_2 emissions, the collection of Clean Energy Cess, and coal usage from 2000 to 2021 sheds light on how effective corporate green tax policies have been in India. A time-series analysis shows a steady increase in CO_2 emissions, even with the introduction of environmental taxes. The Clean Energy Cess launched in 2010 and the GST Compensation Cess introduced in 2017 didn't lead to a significant drop in emissions.

Regression analysis indicates that coal consumption is the strongest predictor of CO_2 emissions ($p < 0.001$), with a coefficient of 3.36. This means that for every additional million tons of coal consumed, CO_2 emissions increase by about 3.36 million tons. This finding is consistent with global emission patterns and underscores coal's role as the primary driver of emissions in India.

While green tax revenue shows a statistically significant but slightly negative correlation with CO_2 emissions ($p = 0.0439$), the coefficient of -0.00025 suggests that for every ₹1 crore increase in green tax revenue, emissions only decrease by 250 tons. This highlights the limited effectiveness of fiscal measures alone in reducing emissions. A correlation analysis was also performed to explore the relationships between key variables.

The Pearson correlation coefficient between CO_2 emissions and the Clean Energy Cess amount was found to be 0.777, indicating a strong positive correlation. Furthermore, the correlation between coal consumption and CO_2 emissions was an impressive 0.989, suggesting an almost perfect positive relationship. This reinforces the established connection between coal consumption and carbon emissions, confirming that coal continues to be the leading contributor to India's greenhouse gas emissions.

These findings indicate that while green tax policies have successfully brought in significant revenue, their effectiveness in actually reducing CO_2 emissions and limiting coal consumption is still up in the air. The strong link between emissions and coal use highlights the urgent need for more profound changes in India's energy sector, going beyond just taxation.

5.2. Policy Implications:

The insights from this study shed light on the real-world impacts and effectiveness of green tax initiatives aimed at India's coal-based power sector. Each key finding comes with a policy suggestion:

1. Key Finding: Coal consumption is the strongest predictor of CO_2 emissions, boasting the highest correlation ($r = 0.998$) and a statistically significant coefficient in the regression analysis.

Recommendation: India should implement a phased strategy to reduce coal use, supported by a national cap on coal consumption. This should be complemented by legally binding targets to speed up the shift to renewable energy and increase the share of non-fossil fuel energy in the national grid.

2. Key Finding: Despite the introduction of the Clean Energy Cess and the GST Compensation Cess, CO_2 emissions did not decrease as anticipated. In fact, emissions increased at every stage of policy implementation.

Recommendation: Integrate green taxes into a broader policy framework that includes binding pollution limits, stricter regulations, and direct investments in clean technology. A standalone tax will never be enough to reduce emissions on its own.

3. Key Finding: The effect of green-tax revenue on emissions was minimal and statistically weak, with emissions and revenue moving in tandem ($r = 0.754$).

Recommendation: Keep green-tax funds separate, ensuring that every rupee is directed towards renewables, clean-tech research and development, and local reduction plans, rather than being mixed with GST bailouts or unrelated expenditures.

4. Key Finding: The GST Compensation Cess shifted the focus of green taxation from environmental reform to fiscal compensation, diluting the original climate objectives.

Recommendation: Realign India's tax instruments to clearly support climate goals and introduce performance-linked rebates for companies that meet decarbonization targets, while imposing penalties on those that fall short.

5.3 Limitations of the Study:

1. This study pulls together secondary data from a mix of government and international sources. However, differences in how data is collected, the standards used for reporting, and possible biases in government reports could affect how accurate and reliable the findings are.
2. India’s energy sector has seen several policy shifts, including incentives for renewable energy, emission trading schemes, and various industrial regulations. The study doesn’t separate the effects of these policies, which makes it tough to pinpoint the specific impact of green taxation.
3. The study looks at emissions trends before and after green taxation policies were introduced, but the period after 2017 is still relatively short. The long-term effects of the GST Compensation Cess on emissions and coal consumption might not be fully visible yet.

4. Changes in the global economy, fluctuations in fuel prices, and shifts in industrial demand could have affected coal consumption and emissions, regardless of green taxation policies.
5. The study overlooks how businesses might have adjusted to taxation policies through improvements in efficiency, switching fuels, or lobbying efforts, which could have influenced how effective the taxation measures were.

5.4 Conclusion:

This paper takes a close look at how India's green tax policyspecifically the Clean Energy Cess from 2010 to 2017 and the GST Compensation Cess from 2017 to 2021has influenced CO_2 emissions from coal-based thermal power plants. Through a time-series and regression analysis between 2000 and 2021, the results paint a less than sobering picture: revenue targeting succeeded, but the same cannot be said for the environment.

While both were cast as mechanisms to internalize the cost of pollution, neither policy caused emissions to fall nor the behavior of coal consumption to change. The strong relationship between coal consumption and emissions prove the dominance of coal in energy, and the less significant effect of tax revenues on emissions unveils the inability of policy in reshaping industrial selections.

This study concludes that green tax is not a cure in its present state. It needs to be re-envisioned as a component in a multi-dimensional policy package linking fiscal, regulatory and technological levers to underpin India's low-carbon transition. If green tax policies must work in a developing country like India, their purpose, design, and reinvestment have to be in sync.

References:

1. Bhatia, P., & Gupta, K. (2020). A feasibility study of implementation of green tax. *International Journal of Scientific & Technology Research*, 9(3), 123–130.
2. Pegels, A. (2016). Taxing carbon as an instrument of green industrial policy in developing countries. *Climate Policy*, 16(4), 501–515.
3. Mukherjee, S. (2022). Exploring a design of carbon tax for coal- and lignite-based thermal power sector in India. *Energy Policy*, 163, Article 112839.
4. Parry, I. W. H., Mylonas, V., & Vernon, N. (2019). Reforming energy policy in India: Assessing the options (*IMF Working Paper No. WP/19/xx*). International Monetary Fund.
5. Young, E. L. (2018). *Discussion paper on carbon tax structure for India*. New Delhi: Shakti Sustainable Energy Foundation.
6. Ahmad, A., & Mishra, P. P. (2019). Evaluating the performance of carbon tax on green technology: Evidence from India. *Environmental Science and Pollution Research*.
7. Sarangi, G. K., & Taghizadeh-Hesary, F. (2020). Unleashing market-based approaches to drive energy efficiency interventions in India: An analysis of the Perform, Achieve, Trade

(PAT) scheme. *Asian Development Bank Institute Working Paper No. 1177*.

8. Organisation for Economic Co-operation and Development (OECD). (2021). *Pricing GHG emissions: India country notes*.
9. Prasad, M. (2022). Hidden benefits and dangers of carbon tax. *PLOS Climate*, 1(7), e0000052.
10. Maheshwari, R. (2022). Study on economic, sustainable development, and fuel consumption. *ASEAN Journal of Economic and Economic Education*, 1(1), 41–46.
11. Mohan, M. (2024). *A legal outline on initiatives towards green tax*. GIFT Research Institute.
12. Zhao, X., & Sun, Y. (2022). Impact of environmental tax on corporate sustainable performance. *Environmental Science and Pollution Research*.
13. Press Information Bureau (PIB). (2015). *From carbon subsidy to carbon tax: India's green actions*. Ministry of Finance, Government of India.
14. Ernst & Young (EY). (2025). *India's green manufacturing revolution and the journey to netzero*.
15. Anguralia, N., & Singh, S. (2024). A comparative study on India's green tax policies vis-avis China with reference to environmental justice in the automobile industry. *Nature Environment and Pollution Technology*, 23(4), 2283-2290.
16. Gupta, A., & Sharma, R. (2020). The impact of carbon taxes on growth emissions and welfare in India. *Indian Economic Journal*, 68(2), 215-230.
17. Kumar, P., & Singh, A. (2021). Carbon taxes could be India's inclusive climate mitigation strategy. *Centre for Budget and Governance Accountability*.
18. Parry, I., Mylonas, V., & Vernon, N. (2019). Reforming energy policy in India: Assessing the options. *International Monetary Fund*.
19. Sharma, S., & Choudhury, A. (2022). Impact of carbon tax and environmental regulation on inbound cross-border investments: Evidence from India. *Sustainability*, 10(4), 106-120.
20. Shakti Foundation. (2018). Discussion paper on carbon tax structure for India: Full report. *Shakti Sustainable Energy Foundation*.
21. Sinha, R., & Gupta, M. (2020). Carbon taxes and greenhouse gas emissions trading systems: An overview of the Indian context. *Environmental Science & Policy*, 112, 1-10.
22. UNDP (2025). Carbon tax in an evolving carbon economy: Policy implications and recommendations for India. *United Nations Development Programme*.
23. Verma, S., & Yadav, R. (2023). Evaluating the effectiveness of India's green tax policies on reducing carbon emissions: A pre- and post-implementation analysis. *Journal of Environmental Management*, 300, 113685.

24. Yadav, P., & Kumar, V. (2021). Climate policy co-benefits in India: A review of the impacts of carbon pricing mechanisms on emissions reductions and economic growth. *Climate Policy*, 21(3), 300-315.
25. Sen, S., & Sahoo, P. (2024). Carbon pricing for sustainable transition in India. Environmental Economics and Policy Studies, 26(1), 45–65.