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REVIEWER'S REPORT

Manuscript No.IJAR-54099

Title: Impact of Economic Activity on PM2.5 Levels in India: An empirical study on selective Indian Districts

Recommendation:
Accept as it is .....
Accept after minor revision YES
Accept after major revision .....
Do not accept (*Reasons below*).....

Rating	Excel.	Good	Fair	Poor
Originality		YES		
Techn. Quality		YES		
Clarity		YES		
Significance	YES			

Reviewer Name: Dr. Himanshu Gaur **Date:**29/09/2025

Detailed Reviewer's Report

The research paper *Impact of Economic Activity on PM2.5 Levels in India: An Empirical Study on Selective Indian Districts* presents a timely and ambitious analysis of how rural and urban economic activities contribute to air pollution, particularly PM2.5, across Indian districts. By using district-level data from SHRUG, ICRISAT, and Census sources, the study builds a cross-sectional model for 2013 that links PM2.5 levels to sectoral economic activity, forest cover, and fuel usage. The strength of the paper lies in its multizonal approach, which disaggregates India into five regions (North, South, East, West, and Central), allowing it to highlight region-specific pollution drivers: stubble burning in the North, mining and agriculture in the East and Central, dust and industrialization in the West, and comparatively lower but notable biomass usage in the South. The regression analysis quantifies these relationships, showing, for instance, that deforestation in Central and Western India has a particularly strong impact on PM2.5 concentrations, and that biomass fuel use remains the most persistent household-level driver of ambient air pollution. The literature review is comprehensive, covering health impacts, sectoral contributions, and governance challenges, while the policy implications are framed around decentralization, fuel transition, sustainable agriculture, afforestation, and targeted regional strategies.

Despite these strengths, the paper has some limitations. The reliance **on cross-sectional data from 2013** constrains its relevance in light of rapid policy changes (such as NCAP, Ujjwala Yojana, and EV policies) after 2015. The methodology, while robust in identifying correlations, is less effective in establishing causality or capturing temporal variations, which are critical given the seasonal nature of stubble burning and mining emissions. The analysis also aggregates industrial activities, missing the chance to disaggregate sectors like coal plants, thermal power, or small-scale manufacturing that vary in their emission profiles. The regression framework sometimes shows statistical insignificance in certain **zones** (e.g., West zone industries), yet these are not deeply interrogated. Moreover, while the policy section rightly emphasizes decentralization and sector-specific interventions, it could benefit from sharper prioritization (e.g., ranking interventions by impact potential) and stronger connections to

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existing government schemes. Editorially, the paper is dense in parts and could use clearer visuals (maps or charts) to illustrate regional disparities more effectively.**Accept with Minor Revision**

Recommendations for the Author:

1. **Update Data and Extend Temporality** – Incorporate recent datasets (post-2015) or longitudinal trends to strengthen the relevance of findings in light of policy shifts.
2. **Sectoral Disaggregation** – Break down industrial and agricultural activities into subcategories (thermal plants, small-scale manufacturing, mechanized farming, etc.) to better capture heterogeneity in pollution sources.
3. **Causality and Seasonality** – Consider panel or time-series analysis to identify causal linkages and capture seasonal dynamics like stubble burning or monsoon-driven dust suppression.
4. **Strengthen Statistical Rigor** – Explore alternative econometric techniques (fixed effects, interaction terms, instrumental variables) to improve significance and robustness of findings.
5. **Enhance Visualization** – Use spatial maps, quartile plots, or regression coefficient graphs to make regional disparities and sectoral contributions clearer for policymakers.
6. **Sharpen Policy Implications** – Prioritize recommendations by potential impact (e.g., clean fuel transition in Central/East, stubble management in North, afforestation in West), and link them explicitly to NCAP, Ujjwala, CAMPA, and state-level interventions.
7. **Address Governance Gaps** – Provide more actionable strategies on how decentralization could work in practice, such as empowering district pollution boards or integrating panchayat-level monitoring.
8. **Editorial Refinement** – Streamline dense sections of the literature review and discussion, ensuring smoother narrative flow and avoiding repetition.