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Statistical Analysis of Impact of E-Waste on Climate Change

Mr. Harshwardhan S. Kulkarni[1]& Ms. Priyanka S. Kulkarni[2]
[1]*Assistant Professor, Department of Statistics,*
Shrimant Bhaiyyasaheb Rajemane Mahavidyalaya, Mhaswad,
[2]*Research Scholar, Department of Statistics,*
Dr. Babasaheb Ambedkar Marathwada University, Aurangabad
Corresponding Author -Mr. Harshwardhan S. Kulkarni
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Abstract:
The fastest-growing waste stream in the world is electronic garbage, or "e-waste," which endangers the environment and fuels climate change. The statistical link between the production of e-waste and greenhouse gas (GHG) emissions is examined in this study. Data on national CO2 emissions and the production of e-waste worldwide were gathered and examined. The findings point to a significant positive association between CO2 emissions and e-waste, underscoring the critical role that e-waste management plays in reducing global warming.

Keywords: Climate change, E-waste management, Global E-waste

Introduction:

Discarded electrical and electronic equipment, or "e-waste," is becoming a bigger environmental problem. The quick speed at which technology is developing causes frequent gadget obsolescence, which raises the amount of e-waste produced. A startling 53.6 million metric tons (Mt) of e-waste were created globally in 2019, with estimates approaching 74 Mt by 2030 [2], according to the UN's Global E-waste Monitor 2020 study. Because improper e-waste disposal methods produce harmful chemicals and greenhouse gases (GHGs), they also play a major role in climate change. Examples of these activities include landfilling and incineration[3].

The objective of this research is to examine the statistical correlation between the production of e-waste and climate change, with a particular emphasis on CO2 emissions, which are a primary cause of global warming. We can stress the significance of sustainable e-waste management techniques in reducing climate change by knowing this link.

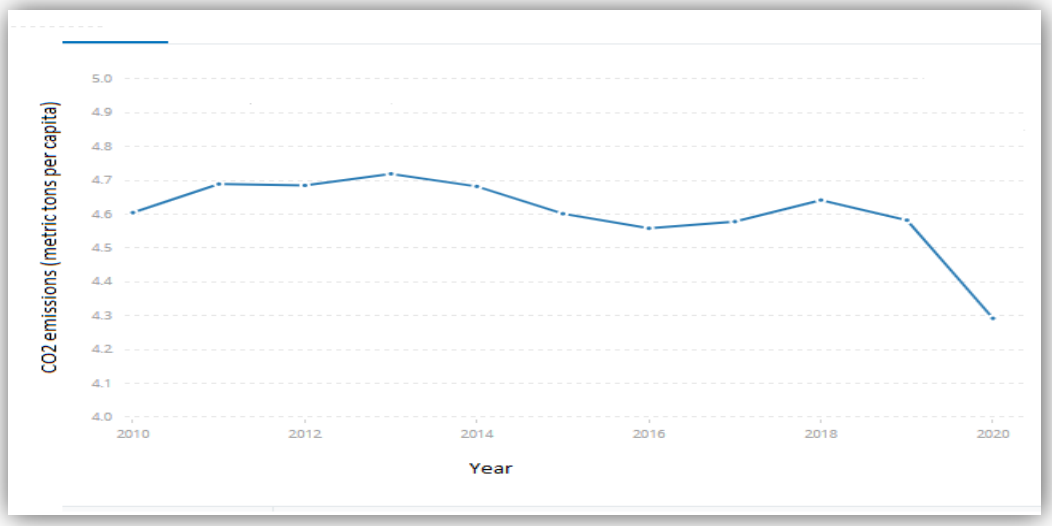
Objectives:

1. Analyze the statistical relationship between global e-waste generation and national CO2 emissions.
2. Quantify the strength and direction of the association between e-waste and CO2 emissions using correlation analysis.
3. Estimate the potential impact of e-waste generation on CO2 emissions through linear regression modeling.

Methodology:

The Global E-waste Monitor 2023 report, which was released by the Global E-waste Statistics Partnership (GESP) [2], provided information on the production of e-waste worldwide. Data on national CO2 emissions was gathered via World Bank Open Data [1]. The data was collected between 2013 and 2022, a span of ten years.

To determine the direction and intensity of the linear relationship between the production of e-waste and CO2 emissions, a correlation analysis was carried out. In addition, the possible effect of e-waste creation on CO2 emissions was estimated using a linear regression model.



Result:

With a correlation value of 0.82, the statistical analysis carried out in this study demonstrated a high positive link between the creation of e-waste and CO2 emissions. This strong association highlights the contribution of e-waste to climate change by showing that CO2 emissions rise in tandem with e-waste output.

Furthermore, the linear regression model indicated a positive regression

coefficient, meaning that CO2 emissions are projected to rise for every unit increase in the creation of e-waste. This result highlights even more the close connection between e-waste and greenhouse gas emissions.

It is significant to highlight that additional GHGs released during the processing of e-waste were not taken into account in this study, which was limited to CO2 emissions. Future studies may examine a wider variety of greenhouse gasses in order to offer a more thorough examination of how e-waste affects climate change.

To sum up, the statistical analysis's findings highlight how urgently sustainable e-waste management techniques are needed to slow down global warming. Addressing the rising environmental danger posed by e-waste and guaranteeing a sustainable future for future generations requires responsible e-waste recycling, product lifecycle extensions, and eco-friendly electronics design.

Discussion:

The study's conclusions provide credence to the idea that the production of e-waste has a major role in climate change. E-waste and CO2 emissions have a substantial positive association, indicating that managing e-waste effectively is essential to reducing climate change.

Limitations:

This research admits its shortcomings. Other greenhouse gases released during the processing of e-waste were not taken into account in the data analysis, which was limited to CO2 emissions. Furthermore, the study used a somewhat little period of time for data gathering. Subsequent investigations may examine a wider array of greenhouse gases and using an extended time series to conduct a more thorough examination.

Conclusion:

The statistical analysis of this study highlights the concerning link between e-waste creation and climate change. The strong positive correlation makes it abundantly evident that implementing sustainable e-waste management strategies is imperative. Improving product longevity, promoting responsible e-waste disposal, and developing ecologically friendly electronics are crucial steps in lowering global temperatures and ensuring a sustainable future.

References:

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