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### Peer review history for:

Nundze S, Ogunlaja A, Eastwood K, Thwala M, Melariri P. Investigation of nanomaterial and hazardous emissions at coal-fired power stations in Mpumalanga, South Africa. *S Afr J Sci.* 2024;120(11/12), Art. #16062. <https://doi.org/10.17159/sajs.2024/16062>

#### HOW TO CITE:

Investigation of nanomaterial and hazardous emissions at coal-fired power stations in Mpumalanga, South Africa [peer review history]. *S Afr J Sci.* 2024;120(11/12), Art. #16062. <https://doi.org/10.17159/sajs.2024/16062/peerreview>

#### Reviewer D: Round 1

**Date completed:** 25 August 2023

**Recommendation:** Accept / **Revisions required** / Resubmit for review / Decline

**Conflicts of interest:** None

Does the manuscript fall within the scope of SAJS?

Yes/No

Is the manuscript written in a style suitable for a non-specialist and is it of wider interest than to specialists alone?

Yes/No

Does the manuscript contain sufficient novel and significant information to justify publication?

Yes/No

Do the Title and Abstract clearly and accurately reflect the content of the manuscript?

Yes/No

Is the research problem significant and concisely stated?

Yes/No

Are the methods described comprehensively?

Yes/No

Is the statistical treatment appropriate?

Yes/No/Not applicable/Not qualified to judge

Are the interpretations and conclusions justified by the research results?

Yes/**Partly**/No

Please rate the manuscript on overall contribution to the field

Excellent/**Good**/Average/Below average/Poor

Please rate the manuscript on language, grammar and tone

Excellent/**Good**/Average/Below average/Poor

Is the manuscript succinct and free of repetition and redundancies?

Yes/No

Are the results and discussion confined to relevance to the objective(s)?

Yes/No

The number of tables in the manuscript is

Too few/**Adequate**/Too many/Not applicable

The number of figures in the manuscript is

Too few/**Adequate**/Too many/Not applicable

Is the supplementary material relevant and separated appropriately from the main document?

Yes/No/**Not applicable**

Please rate the manuscript on overall quality

Excellent/**Good**/Average/Below average/Poor

Is appropriate and adequate reference made to other work in the field?

Yes/No

Is it stated that ethical approval was granted by an institutional ethics committee for studies involving human subjects and non-human vertebrates?

Yes/No/**Not applicable**

If accepted, would you recommend that the article receives priority publication?

Yes/No

Are you willing to review a revision of this manuscript?

Yes/No

Select a recommendation:

Accept / **Revisions required** / Resubmit for review / Decline

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Yes/No

#### Comments to the Author:

Dear Authors,

Thank you for the opportunity to review your paper. After careful consideration, I have found that your paper has potential but requires minor revisions before it can be accepted for publication. Please find my comments below:

1. This is an excellent paper that makes an important contribution to the field.
2. The research is well-designed and the methodology is sound, providing strong evidence to support the authors' conclusions
3. The writing is clear and concise, making the paper easy to read and understand.
4. The authors have done an excellent job of synthesizing and interpreting the literature on this topic.
5. 2.1. Description of the study area: It is suggested that the authors must consider adding a map of the study area under this section.
6. The results are clear and well-organized, making it easy to follow the authors' thought process.
7. The implications of the authors' research are significant and should be explored further in future studies.
8. The paper is well-referenced and demonstrates a thorough understanding of the literature in the field.
9. The discussion of the results is thoughtful and insightful, providing useful insights into the implications of the authors' findings.
10. The authors have done an excellent job of presenting their data and interpreting the results in the context of the literature.
11. The conclusion must be supported with data. Same with the abstract section. The paper has enough data. Therefore, authors must support their conclusions with data!
12. Overall, I would strongly recommend this paper for publication.
13. However, I believe that with these revisions, your paper has the potential to make a significant contribution to the field.

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#### Author response to Reviewer D: Round 1

Description of the study area: It is suggested that the authors must consider adding a map of the study area under this section

AUTHOR: Comment Accepted: new Figure 1 inserted.

The conclusion must be supported with data. Same with the abstract section. The paper has enough dat.

Therefore, authors must support their conclusions with data

AUTHOR: Comment Accepted. The conclusions made are based on results presented in Section 3; conclusion on presence of nanoparticles in the samples is supported by Figures 4 and 5 (new figure numbering). The conclusions concerning the presence and ranges of metals are based and supported by data from Table 2 and 4, as well as Figure 6.

**Reviewer G: Round 1**

**Date completed:** 19 June 2023

**Recommendation:** Accept / **Revisions required** / Resubmit for review / Decline

**Conflicts of interest:** None

Does the manuscript fall within the scope of SAJS?

**Yes/No**

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Are you willing to review a revision of this manuscript?

Yes/No

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Yes/No

**Comments to the Author:**

1. Original Paper

1.1. Recommendation

Minor Revision

2. Comments to Author

Title: A Baseline Investigation of Nanomaterial and Hazardous Emissions at the Matla and Kriel Coal Fired Power Stations in the Mpumalanga Province

2.1 Overview

In South Africa, coal-fired power plants remain the primary source of electricity production. Fly ash and slag are produced during coal combustion, and particulate matter emissions that contain nanoscale elements are also increased, posing environmental perils. Therefore, the current study looking into nanoparticle emissions from coal-fired power plants is crucial from an academic standpoint. Scanning Electron Micrograph (SEM), Transmission Electron Micrograph (TEM), and X-Ray fluorescence spectrometer (XRF) were used to analyze soil and dust samples taken from the Matla and Kriel power stations. The study concluded that coal-fired power plants are a possible source of nano-pollution, indicating elevated levels of exposure for people and the environment around such facilities.

The essay is thorough and well-written. The writers meticulously and in-depth collected, processed, and analyzed the data. The research is beneficial from an academic standpoint. In my opinion, the paper's descriptions are thorough and academically sound. I need a few clarifications before suggesting this manuscript for publication. I thus suggest that a minor revision is necessary. I list my concerns below. I request that the writers respond to each of my concerns.

Results

The study confirmed an exceedance of the South African and international permissible limits for dust and the presence of heavy metals at levels that commonly exceeded various South African allowable limits. For example, more than 50% of all dust samples collected exceeded the allowable limits for South Africa, EU, US EPA, and WHO guidelines. Also, the average concentrations of Cr in both power stations exceeded the maximum allowable limits of South Africa, WHO, EU, and US EPA. Having reported the results, do you have previous works supporting or contracting your findings? The absence of comparative analysis makes your analysis too shallow? Again, What is the implication when the average concentrations of metals (e.g., Cr) in both power stations exceeded the maximum allowable limits of South Africa, WHO, EU, and US EPA?

Conclusions

You have to deepen the policy recommendations and Identify areas for future studies.

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### Author response to Reviewer C: Round 1

Results

The study confirmed an exceedance of the South African and international permissible limits for dust and the presence of heavy metals at levels that commonly exceeded various South African allowable limits. For example, more than 50% of all dust samples collected exceeded the allowable limits for South Africa, EU, US EPA, and WHO guidelines. Also, the average concentrations of Cr in both power stations exceeded the

maximum allowable limits of South Africa, WHO, EU, and US EPA. Having reported the results, do you have previous works supporting or contracting your findings? The absence of comparative analysis makes your analysis too shallow? Again, What is the implication when the average concentrations of metals (e.g., Cr) in both power stations exceeded the maximum allowable limits of South Africa, WHO, EU, and US EPA?

AUTHOR: Comment Accepted. The updated manuscript grounds comparative analysis of exposure on the National Norms and Standards for the Remediation of Contaminated Land and Soil Quality in the Republic of South Africa, and no longer the guidelines used in the earlier version; Tables 2 and 3 provides such comparison.

Furthermore, Section 4 (Pg 17, Line 369-377) now outlines the absence of local studies in the analytical matrices of the current study, hence poor comparative assessment, and where comparison with international data is not suitable due to natural geological differences that exists between location.

Conclusions

You have to deepen the policy recommendations and Identify areas for future studies.

AUTHOR: Comment Accepted. With regards to policy recommendation: the manuscript now recommends for long term dust monitoring as part of corporate HSE policies. At this stage due to the poor state of data, it will be baseless to recommend government policy consideration since the cause-and-effect case has not been established, for now advocacy for long term monitoring can be raised.

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### Reviewer G: Round 2

**Date completed:** 13 August 2024

**Recommendation:** **Accept** / Revisions required / Resubmit for review / Decline

**Conflicts of interest:** None

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**Yes/No**

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**Yes/No**

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**Yes/No**

Select a recommendation:

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**Yes/No**

### **Comments to the Author:**

#### Paper Overview

The paper investigates the nanoparticle emissions from coal-fired power stations, focusing on two specific stations: Matla and Kriel, located in the Mpumalanga Province of South Africa. The study collected soil and dust samples within 500 meters and 1 kilometer from these power stations to analyze the presence of nanoparticles (NPs) and heavy metals using Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM), and X-ray Fluorescence (XRF) analysis. The paper aims to determine whether these power stations are potential hotspots for nano-pollution and the environmental and human health risks posed by these emissions

The study addresses a critical environmental and public health issue, especially in a region heavily reliant on coal-fired power stations. Given the global move towards cleaner energy, understanding the risks associated with traditional power generation is essential. The study employs advanced analytical techniques (SEM, TEM, XRF) to accurately characterize the nanoparticles and their composition. This adds a layer of reliability to the findings. By collecting samples from both soil and dust across different proximities to the power stations, the study provides a detailed understanding of the spatial distribution of pollutants. The identification of nanoparticles, particularly those containing hazardous heavy metals, highlights a significant environmental concern. The paper's emphasis on the absence of environmental limits for such nanomaterials underlines the need for regulatory attention.

The paper is valuable and I recommend it for publication. However, it could be significantly enhanced by addressing the following points:

- **Lack of Control Samples:** The absence of control samples from unaffected areas limits the ability to establish a clear baseline for comparison. Incorporating such controls would strengthen the causal link between power station emissions and the observed findings. Or this could be a suggestion for future consideration?
- **Limited Discussion on Health Implications:** While the paper acknowledges potential health risks, a more in-depth exploration of specific health outcomes for the local population is warranted. A detailed analysis of health implications, potentially including a health survey of the study areas, would significantly increase the paper's impact. Or this could be a suggestion for future consideration?
- **Weak Policy Recommendations:** The paper presents intriguing findings but falls short in providing concrete policy recommendations. Developing specific, actionable suggestions based on the research would enhance its practical value and influence on decision-making.

These improvements would contribute to a more comprehensive and impactful study.

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**Reviewer F: Round 1**

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