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Paper: **"GIS-Based Modeling of Site Suitability and Capacity for Small Hydropower Generation in Edo State, Southern Nigeria"**

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Peer review:

Reviewer 1: Blinded

Reviewer 2: Blinded

Reviewer 3: Blinded

Reviewer B:
Recommendation: Resubmit for Review

The TITLE is clear and it is adequate to the content of the article.
Necessary corrections have been advised in thus regard, in my comments.
The ABSTRACT clearly presents objects, methods, and results.
Necessary corrections have been advised in thus regard, in my comments.
There are a few grammatical errors and spelling mistakes in this article.
Necessary corrections have been advised in thus regard, in my comments.
The study METHODS are explained clearly.
Necessary corrections have been advised in thus regard, in my comments.
The body of the paper is clear and does not contain errors.
Necessary corrections have been advised in thus regard, in my comments.
The CONCLUSION or summary is accurate and supported by the content.
Necessary corrections have been advised in thus regard, in my comments.
The list of REFERENCES is comprehensive and appropriate.
Necessary corrections have been advised in thus regard, in my comments.
Please rate the TITLE of this paper.
[Poor] **1-5** [Excellent]
3

Please rate the ABSTRACT of this paper.
[Poor] **1-5** [Excellent]
2

Please rate the LANGUAGE of this paper.
[Poor] **1-5** [Excellent]
3

Please rate the METHODS of this paper.
[Poor] **1-5** [Excellent]
2

Please rate the BODY of this paper.
[Poor] **1-5** [Excellent]
2

Please rate the CONCLUSION of this paper.
[Poor] **1-5** [Excellent]
3

Please rate the REFERENCES of this paper.

[Poor] **1-5** [Excellent]
1

Overall Recommendation!!!
Return for major revision and resubmission

Comments and Suggestions to the Author(s):
The study presents a methodological framework for SHP site suitability assessment in Edo State, Nigeria, leveraging GIS and AHP. While the approach has merit, the article requires strengthening in several areas to enhance its rigor and practical applicability. The analysis is somewhat limited by a lack of depth in methodological explanation and insufficient consideration of critical non-technical factors. Ultimately, while the study identifies potential, it falls short of providing a comprehensive decision-making tool for SHP development. I nonetheless have a few moderate comments and suggestions that might help fit the paper within the aims and scope of this particular journal:

[1] While the introduction adequately establishes the context and need for the study, it relies heavily on general statements about renewable energy. A more focused and critical appraisal of the specific energy challenges (e.g., https://doi.org/10.48048/tis.2024.8538) and opportunities within Edo State would add greater value. The literature review, while present, could be more critically evaluative. There's a tendency of the paper to state findings from previous studies without sufficiently analyzing their relevance, limitations, and contradictions.
[2] The methodology section, while outlining the steps, often lacks sufficient detail for replication and critical appraisal. For instance, the process of assigning weights in the AHP analysis is crucial, yet the article provides a rather superficial explanation. The justification for specific weightings and the sensitivity analysis conducted (if any) are unclear. The reclassification process in ArcGIS is mentioned, but the rationale behind the chosen scale (1 to 4) and the specific criteria for assigning values within that scale need more rigorous explanation. The subjectivity inherent in this process needs to be acknowledged and addressed more transparently.
[3] The determination of the penstock length (50m) appears arbitrary. The article states it's based on "careful consideration of past scholarly works," but it fails to explain why 50m is appropriate for the diverse topography of Edo State. This lack of transparency is a significant weakness. While the technical parameters (soil, geology, hydrology, slope) are considered, the methodology is heavily biased towards them. The absence of a robust framework for integrating environmental and socio-economic factors is a major shortcoming.
[4] The results presentation is generally clear, but the discussion remains largely descriptive. There's insufficient critical analysis of the spatial patterns observed and the interrelationships between different parameters. The discussion acknowledges the theoretical nature of the energy output estimates, which is commendable. However, it fails to delve into the implications of this uncertainty for decision-making. A more thorough error analysis and sensitivity analysis (e.g., https://doi.org/10.1061/(asce)ee.1943-7870.0001381) would be necessary to assess the robustness of these estimates. The study identifies three "highly suitable" sites. However, the criteria for "high suitability" are not clearly defined. A more rigorous classification or ranking system, with clear thresholds and justifications, would lend more credibility to the findings.
[6] In conclusion, while the study provides a useful starting point for SHP site assessment in Edo

State, it requires substantial improvement in methodological rigor, transparency, and comprehensiveness. The authors need to address the identified weaknesses to produce a more robust and practically relevant decision-support tool.

Reviewer D:
Recommendation: Revisions Required

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yes
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yes
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yes
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[Poor] **1-5** [Excellent]
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Please rate the ABSTRACT of this paper.
[Poor] **1-5** [Excellent]
3

Please rate the LANGUAGE of this paper.
[Poor] **1-5** [Excellent]
3

Please rate the METHODS of this paper.
[Poor] **1-5** [Excellent]
3

Please rate the BODY of this paper.
[Poor] **1-5** [Excellent]
3

Please rate the CONCLUSION of this paper.

[Poor] **1-5** [Excellent]
3

Please rate the REFERENCES of this paper.
[Poor] **1-5** [Excellent]
3

Overall Recommendation!!!
Accepted, minor revision needed

Comments and Suggestions to the Author(s):
The manuscript titled "Modeling Site Suitability and Capacity for Small Hydropower Generation in Edo State, Southern Nigeria" provides a comprehensive GIS- and remote sensing-based evaluation of small hydropower (SHP) potential. The combination of AHP multi-criteria analysis, runoff modeling via the SCS-CN method, and land use, soil, and geological resistivity mapping creates a strong interdisciplinary framework. The study is particularly valuable for addressing the power challenges in southern Nigeria and promoting renewable energy solutions. Nonetheless, clarification on certain assumptions, validation methods, and modeling choices would improve the robustness and practical applicability of the research outcomes.
The following reviewer questions are directed to the authors for further clarification and strengthening of the study:

1. In the runoff estimation using the SCS-CN method, have you validated the curve number assignments against observed flow data or hydrological studies in Edo State?
2. In your AHP process (Table 1), could you elaborate on how the consistency ratio (CR) was evaluated to ensure the logical coherence of the pairwise comparison matrix?
3. While estimating hydropower potential (Equation 5), did you account for seasonal variability in runoff between the wet and dry seasons?
4. The assumption of a uniform 50-meter penstock length is mentioned. Can you justify this design choice in view of topographic variations at different proposed sites?
5. Regarding land use/land cover preference assignments (Table 3), what methodology or criteria were used to determine the unified preference values?
6. Was the slope analysis based on SRTM data validated with higher-resolution DEMs or ground-truth measurements to ensure local accuracy?
7. The runoff depth values (Table 5) appear quite high relative to annual precipitation; could you clarify the abstraction parameters used in your calculations?
8. Were socio-environmental factors, such as proximity to settlements or protected ecosystems, considered during the final site selection phase?
9. How was the spatial interpolation of rainfall from seven stations evaluated for accuracy, especially across mountainous or highly variable regions?
10. Since the gross energy outputs represent theoretical estimates, do you propose any future field measurements (e.g., flow gauging) to validate and refine these site potentials before infrastructure investment?
11. For enhancing the introduction section with the new publications, old references may be replaced with new ones such as:

Harnessing electroosmotic hybrid nanofluid dynamics in curved arteries: insights into biomedical flow enhancement

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