

Peer Review — Land Systems

Interactive Public Peer Review report

Manuscript title: A multiform energy transition: typifying wind and solar energy-land systems in Portugal

Date: 18 June 2026

1. Summary of the manuscript

This work analyses the characteristics of energy-land systems (ELS) in Portugal. A total of 760 individual systems and projects are clustered into 18 groups to enable comparison between them. For each group, several dimensions are tested, leading to a number of conclusions — for example, that wind generation is concentrated in the north, and that utility-scale PV tends to be located in less wealthy areas compared with decentralised PV. Overall, the paper presents a very interesting inventory of renewable energy projects in Portugal.

2. Principal criteria — scores

Score each criterion: Excellent (1), Good (2), Fair (3), Poor (4).

Principal criterion	Score (1-4)
Originality (novelty) — substantial progress beyond current understanding?	1
Scientific quality (rigour) — clear purpose, valid methods, evidence-backed, balanced discussion?	2
Significance (impact) — substantially changes understanding or introduces broadly relevant applications?	2
Presentation quality — clear, logical, concise, well-structured?	1

3. Constructive critique — by section

Abstract

Strengths: The abstract is clearly written and follows a good storyline.

Weaknesses / deficiencies (with reasoning): The abstract overclaims somewhat, as not all of the stated conclusions can be clearly derived from the data. The analysis reads more as descriptive work than as a statistically robust or causal analysis, and the abstract should reflect this more accurately.

Specific improvements needed: Moderate the tone and avoid overstating the results, framing the findings as descriptive rather than causal where appropriate.

Introduction

Strengths: The introduction explains well why social dimensions matter for the energy transition. It moves from the broad context to the specific problem, as is good practice: climate change requires more renewable energy, renewable energy requires land, and this is becoming an increasingly important issue. The authors make the case that planning should incorporate more dimensions than grid access and technically available land alone.

Weaknesses / deficiencies (with reasoning): The introduction sets out a clear problem to be solved — namely, the need for a siting approach that better links the type of project to its specific socio-ecological context, in order to deliver multiple benefits and support both climate targets and a just energy transition. However, the paper does not actually provide solutions to this problem.

Specific improvements needed: The problem statement should be more closely linked to the actual research work and the research questions, which are good. The choice of Portugal as a case study currently seems somewhat arbitrary and should be better embedded in the storyline.

Methods

Strengths: The paper uses a wide variety of methods, including tests of their validity.

Weaknesses / deficiencies (with reasoning): The completeness of the project database is not stated (for example, in comparison with total installed capacity). In particular, the number of small-scale decentralised PV projects is very low compared with the number of real installations — a quick search suggests roughly 120,000 systems — which raises the question of how representative the data can be. In addition, the methods section reads more as a narrative account of what was done, step by step, than as a justification of the chosen approach and the selection of methods.

Specific improvements needed: Revisit the small-scale PV data. Revise the text to focus on why each step was taken rather than simply how.

Results

Strengths: The inventory is very good, the clusters are interesting, and Sections 3.1 and 3.2 contain a great deal of information that is valuable in its own right. Section 3.3 adds a further level of insight by comparing the social and ecological characteristics of the plants.

Weaknesses / deficiencies (with reasoning): The study remains descriptive, even though some statements are phrased as though they establish causal relationships.

Specific improvements needed: Take care not to overinterpret the data, and focus on describing patterns. As an optional addition, the “why” behind some observations — for example, why decentralised ELS are generally found in less socially marginalised contexts than utility-scale ELS — could be explored through an additional literature review or expert interviews. This would add significant value, though it may be beyond the scope of the present work.

Discussion

Strengths: The discussion picks up the results and begins to interpret them well.

Weaknesses / deficiencies (with reasoning): It is quite long and repeats some of the results.

Specific improvements needed: Focus on one main statement per sub-chapter. First state the claim based on the descriptive data, then interpret it and explain why you think the results look as they do (this is the appropriate place for such reasoning, rather than the conclusions), and finally test the claim against other studies — especially in Section 4.4.

Conclusions

Strengths: —

Weaknesses / deficiencies (with reasoning): The conclusions overinterpret the results and draw too many social and just-transition claims that are not supported by the results presented.

Specific improvements needed: Keep the conclusions simpler and more closely aligned with the results section. Focus instead on how the data can be used for the future planning and siting of renewable energy projects.

4. Detailed considerations

Does the title clearly reflect the contents? Yes.

Does the abstract provide a concise and complete summary? Yes, with some improvements needed (see above).

Is proper credit given to related work, with the authors' own contribution clearly indicated? Yes. The research gap is clear and is addressed by a new methodological framework and new data.

Does the paper address relevant scientific questions within the scope of Land Systems? Yes.

Are methods and assumptions valid and clearly outlined? Partly (see above).

Are experiments/calculations described precisely enough to be reproduced? Yes.

Are the results sufficient to support the interpretations and conclusions? No. The conclusions are not fully justified by the data and the approach (see above).

Are substantial conclusions reached? Partly (see above).

Are references appropriate in number and quality? The cited literature looks comprehensive and relevant. More credit could be given to energy-planning research and to how this approach could be integrated into planning or even energy-system modelling, for example:

- Krumm et al., “Modelling social aspects of the energy transition: What is the current representation of social factors in energy models?”
- Hörsch et al., “PyPSA-Eur: An Open Optimisation Model of the European Transmission System”
- Risch et al., “Potentials of Renewable Energy Sources in Germany and the Influence of Land Use Datasets”

Is the supplementary material appropriate in amount and quality? Yes.

Is the language fluent and precise? Yes.

Are formulae, symbols, abbreviations, and units correctly defined and used? A few corrections are needed: “Floatvoltaic” should, in my view, be “floating PV”; and in Table 1, “energy production” should not be linked to installed capacity — it would be better termed “renewable capacity”.

Should any parts (text, formulae, figures, tables) be clarified, reduced, combined, or eliminated?

Figure 2: the unit is missing on the y-axis of the upper-left graph. More generally, the x-axis should be labelled in every figure, as some plots currently lack a clear axis label and this makes them harder to interpret.

5. Recommendation

- ☐ Accept as is
- ☐ Minor revisions
- ☒ **Major revisions**
- ☐ Reject

Brief justification: The paper itself is interesting and of high quality, but it overclaims its results and conclusions, and this needs to be corrected. In addition, the database for small-scale PV appears questionable, which could substantially change the results.

6. Reviewer declarations

Competing interests. I have no interests that might interfere with an objective review of this manuscript.

Competence. I have adequate expertise to provide an authoritative assessment of this manuscript, with a main focus on energy planning.

Peer review assistance. I did not consult anyone for assistance with this review.

Use of AI tools. I have not used AI tools in conducting this review or preparing these comments, aside from grammar, language, and style checking.

I confirm that all comments above are courteous and capable of withstanding public scrutiny, in line with the Interactive Public Peer Review process.