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Paper: “Urban Sprawl and Spatial Population Estimation Using High-Resolution Satellite Imagery in the Mouila Watershed Areas (Ngounié, Gabon)”

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Corresponding Author: Glenn-Freddy Mihindou Mihindou

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Peer review:

Reviewer 1: Maryam Forghaniallahabadi
University of Dundee, United Kingdom

Reviewer 2: Hussein Sharara
Lebanese University, Lebanon

Reviewer 3: Songkot Dasananda
Suranaree University of Technology, Mueang, Nakhon Ratchasima, Thailand

ESJ Manuscript Evaluation Form 2026

This form is designed to summarize the manuscript peer review that you have completed and to ensure that you have considered all appropriate criteria in your review. Your review should provide a clear statement to the authors and editors of the modifications necessary before the paper can be published, or the specific reasons for rejection.

Please respond within the appointed time so that we can give the authors timely responses and feedback.

NOTE: ESJ promotes a peer review procedure based on scientific validity and technical quality of the paper (not perceived impact). You are also not required to do proofreading of the paper. It could be recommended as part of the revision.

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Reviewer Name: Maryam Forghaniallahabadi	
University, Country: University of Dundee, United Kingdom	
Date Manuscript Received: 7 July 2026	Date Review Report Submitted: 16 July 2026
Manuscript Title: Urban Sprawl and Spatial Population Estimation Using High-Resolution Satellite Imagery in the Mouila Catchment Areas (Ngounié, Gabon)	
ESJ Manuscript Number: 08	
You agree that your name is revealed to the author of the paper: Yes	
You approve that your name as a reviewer is available in the "review history" of the paper: Yes You approve that this review report is available in the "review history" of the paper: Yes	

Evaluation Criteria:

Please give each evaluation item a numeric rating on a 5-point scale, along with a thorough explanation for each point rating.

Questions	Rating Result [Poor] 1-5 [Excellent]
1. The title is clear, and it is adequate for the content of the article.	4
The title clearly identifies the subject, principal method, and geographical study area. It is broadly appropriate for the manuscript. Minor improvement is needed for consistency in capitalization and place-name punctuation, and the authors should ensure that the wording accurately reflects that the population figures are estimates derived from building counts rather than directly observed census counts.	
2. The abstract presents objectives, methods, and results.	3
The abstract includes the study objective, imagery sources, digitization approach, population assumption, kriging method, and headline findings. However, it should be revised into consistent past tense; "ordinary Krigeage" should be corrected to "ordinary kriging"; the basis and uncertainty of the five-person-per-building assumption should be	

stated; and the claim that the method provides a “robust alternative” should be moderated until quantitative validation is presented.	
3. There are a few grammatical errors and spelling mistakes in this article.	2
This rating reflects the overall quality of language and presentation. The manuscript contains frequent grammatical, spelling, punctuation, and terminology problems, as well as awkward or incomplete sentences. Examples include “Funding informations”, inconsistent tense, “Krigeage”, missing words in Section 3.3.1 (line 9), and informal wording such as “We stand by this information as we are from the local area.” Professional English-language editing is strongly recommended after the scientific revisions are completed.	
4. The study methods are explained clearly.	2
The broad workflow is understandable, but the methods are not yet sufficiently detailed or validated for replication. Essential information is missing on the exact imagery products and acquisition dates, coordinate reference system, image registration, digitization scale and rules, building classification, field-validation sample, treatment of non-residential and vacant buildings, and uncertainty in the occupancy assumption. The ordinary kriging procedure also lacks a complete equation, variogram parameters, search settings, output resolution, and quantitative cross-validation.	
5. The results are clear and do not contain errors.	2
The basic arithmetic in Table 1 is internally consistent with the stated rule of five persons per roofed building. But several errors and inconsistencies remain, i.e., the density classes overlap (0–5 and 0–15); Doufoura is once described as changing from 2005 rather than 2008; catchment names vary (for example Doussama/Doussouma and Manvouaka/Manvouka); and one catchment appears to be discussed twice in the 2023 density narrative. The results also present modelled estimates as precise values without uncertainty and make infrastructure and policy explanations that are not directly tested.	
6. The conclusions or summary are accurate and supported by the content.	2
The conclusion accurately repeats the manuscript’s calculated building-based population totals, but several statements are stronger than the evidence currently supports. The study does not yet demonstrate that the estimates are robust, nor does it quantitatively test relationships with infrastructure, flooding, wetlands, economic prosperity or pro-natalist policy. The conclusion should clearly distinguish observed building change, model-derived population estimates and interpretive hypotheses, and it should acknowledge major limitations and uncertainty.	
7. The references are comprehensive and appropriate.	2
The reference list contains relevant literature on satellite-based population estimation, urbanization and kriging, but it requires substantial correction. There are duplicate entries for Dureau and Barbary, ESRI, and Yagoub et al.; formatting is inconsistent; at least one URL appears incomplete; MIHINDOU MIHINDOU (2024) is cited but is not clearly listed; and the 2013 population and housing census used to justify the 4.1 household-size figure needs a complete reference. All in-text citations should be checked against the final reference list and formatted consistently.	

Overall Recommendation (mark an X with your recommendation) :

Accepted, no revision needed	
Accepted, minor revision needed	
Return for major revision and resubmission	
Reject	

Comments and Suggestions to the Author(s):

This manuscript addresses an important applied issue concerning urban expansion and the availability of reliable population data in Mouila, Gabon. The use of historical orthophotography, recent high-resolution imagery, manual building digitization, and field observations has the potential to provide useful evidence for local spatial planning. The reported building counts and the arithmetic in Table 1 appear internally consistent. However, substantial revisions are required before the scientific validity and reproducibility of the population estimates and spatial modelling can be adequately assessed. My principal concerns relate to the fixed household-size assumption, the classification of buildings as dwellings, the lack of quantitative validation, the insufficient documentation of the imagery and digitization procedure, and the absence of essential kriging diagnostics and cross-validation.

1. Population estimation and uncertainty

The manuscript estimates population by multiplying each roofed building by five persons. This assumption requires much stronger justification because the manuscript itself reports an official average household size of 4.1. The authors should explain why five were selected, how the fieldwork supports this value, and how ordinary and collective households were identified.

Please clarify how residential buildings were distinguished from shops, schools, offices, storage structures, vacant buildings and buildings containing more than one household. The number, timing, sampling approach and geographical coverage of field observations or surveys should be reported. A validation exercise against census, administrative or sampled household data is needed. At minimum, a sensitivity analysis using 4.1 and 5 persons per dwelling, together with uncertainty ranges, should be provided. The resulting figures should be described as model-based estimates rather than exact population counts.

2. Imagery and digitization procedure

“SAS Planet image” is not an adequate description of a source dataset. Please identify the precise Maxar imagery product and provider, the exact acquisition date, the spatial reference system, the image registration procedure, the positional accuracy, the license conditions, the digitization scale, the minimum mapping unit, and the rules used to define a building unit. Explain how adjoining buildings, partial structures, shadows and roofs obscured by vegetation were handled.

The 2008 and 2023 datasets come from different acquisition systems. The manuscript should discuss how differences in season, resolution, viewing geometry, shadows, image quality and georeferencing may affect the measured change. The drone/field validation should be quantified through a sampling design and an accuracy assessment rather than described only qualitatively.

3. Ordinary kriging and spatial modelling

The authors already have population counts for 100 m × 100 m grid cells, so they should explain why interpolation is necessary rather than mapping the grid-cell densities directly. The complete kriging equation is missing even though its variables are listed.

Please report the empirical variogram, model-fitting procedure, nugget, sill, range, lag structure, search radius, number of neighbors, output-cell size, treatment of zero values and any negative predictions. Quantitative cross-validation statistics such as mean error, root mean square error and standardized error should be included. The spherical model should be justified and compared with reasonable alternatives, including direct grid mapping, kernel density or a dissymmetric approach. Validation by visually comparing the interpolated surface with the same built form used to generate it is circular and cannot establish predictive validity.

4. Unsupported explanatory claims

The manuscript links density patterns to water, electricity and administrative infrastructure and discusses flooding, wetlands, economic prosperity and pro-natalist policy. These factors are not directly analyzed. The authors should either introduce suitable datasets and test these relationships or clearly frame them as tentative interpretations requiring further research. Claims that the approach is a “robust alternative” should be moderated until the population assumptions and spatial model have been quantitatively validated.

5. Internal consistency and technical corrections

The density classes “Very low (0–5)” and “Low (0–15)” overlap; the second category may have been intended as 5–15. Doufoura is described once as changing between 2005 and 2023, although the study period is 2008–2023. Catchment names are inconsistent, including Doussama/Doussouma and Manvouaka/Manvouka. In the 2023 density discussion, Doussama appears to be discussed twice; one reference may have been intended to mean Manvouaka.

The density formula and ordinary kriging equation should be typeset correctly. “Centroids spaced 100 m apart” should be explained precisely in relation to the grid. RGPL should be defined as first use. Please verify all totals, dates, units, class intervals, figure references and catchment names throughout the text.

6. Results, figures and tables

Please enlarge map labels and legends and provide readable scale bars, north arrows, units and coordinate-system information. Use identical class boundaries for the 2008 and 2023 maps and state clearly whether values represent persons per hectare or estimated persons per grid cell. Figure 8 would be clearer as a simple two-dimensional bar chart or table. Figure captions should remain attached to their figures, and map resolution should be improved.

Consider adding a table reporting absolute and percentage change in building units and estimated population by catchment. The manuscript should also distinguish clearly between observed/digitized building change, calculated occupancy-based population estimates and kriging-interpolated density surfaces.

7. Discussion, limitations, language and references

The discussion should engage more critically with the limitations of manual digitization, mixed image sources, the fixed occupancy factor, classification error, spatial autocorrelation assumptions and interpolation uncertainty. The conclusion should include a concise limitations statement and avoid causal claims not tested in the study.

The manuscript requires professional English-language editing. Examples include “Ordinary Krigeage” (ordinary kriging), “Funding informations” (Funding information), inconsistent tense, incomplete sentences, and informal methodological wording. The references should be de-duplicated and standardized. Dureau and Barbary, ESRI and Yagoub et al. appear more than once; incomplete links should be repaired; MIHINDOU MIHINDOU (2024) should be fully listed; and the 2013 census source for the 4.1 household-size value should be referenced.

Overall assessment

The study has potential, but major methodological clarification, validation, and correction are required before the findings can be considered sufficiently reliable and reproducible for publication.

Reviewer D:
Recommendation: Revisions Required

The TITLE is clear and it is adequate to the content of the article.

Yes.

The ABSTRACT clearly presents objectives, methods, results, and conclusions.

Yes.

There are a few grammatical errors and spelling mistakes in this article.

Yes.

The study METHODS are explained clearly.

Yes.

The results are clear and do not contain errors.

Yes.

The CONCLUSION or summary is accurate and supported by the content.

Yes.

The list of REFERENCES is comprehensive and appropriate.

Yes.

Please rate the TITLE of this paper.

[Poor] 1-5 [Excellent]

3

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 RESULTS 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):

1. Sprawl map for the whole area (apart from the dissected ones) should also be included and discussed thoroughly.
2. Causes of the sprawl pattern (for the whole area) should be identified and discussed clearly and , e.g. distance from city center, road network, urban planning, government policies, etc'
3. Current or potential impacts of the sprawl should be discussed systematically, for urban planning/management benefits.

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ESJ editorial office would like to express its special gratitude for your time and efforts. Our editorial team is a substantial reason that stands ESJ out from the crowd!

Reviewer Name: Hussein Sharara	
University, Country: Lebanese University - Lebanon	
Date Manuscript Received: 7 July 2026	Date Review Report Submitted: 19 July 2026
Manuscript Title: Urban sprawl and spatial population estimation using high-resolution satellite imagery in the Mouila catchment areas (Ngounié-Gabon)	
ESJ Manuscript Number: 08.---28.06.2026	
You agree that your name is revealed to the author of the paper: Yes	
You approve, your name as a reviewer of this paper is available in the “review history” of the paper: yes	
You approve, this review report is available in the “review history” of the paper: yes	

Evaluation Criteria:

Please give each evaluation item a numeric rating on a 5-point scale, along with a thorough explanation for each point rating.

Questions		Rating Result [Poor] 1-5 [Excellent]
1. The title is clear, and it is adequate for the content of the article.		5
<i>The title is accurate, unambiguous and perfectly matches the research content, methodology and results.</i>		
Variable detected:		
Variable		
Urban sprawl	First dependent variable	The change in the area/number of built-up 2008 and 2023 (measured via manual digitization)
Spatial population estimation	Second dependent variable	The estimated population and its spatial distribution (built-up units × 5 individuals, then interpolated via Kriging).
High-resolution satellite imagery	Independent variable / Tool	2008 orthophoto and 2023 SAS Planet images are the data sources from which the two variables were derived.
Mouila catchment areas	Spatial scope (Unit of analysis)	The four catchments: Doufoura, Dourougnou and Manvouaka.
Ngounié-Gabon	Broader geographical scope	The administrative/national framework in which the study area is located.
2. The abstract presents objectives, methods, and results.		4
<i>The abstract is comprehensive in its elements (objectives, data, methodology and a numerical result of 31.4 %) but it is slightly lengthy and could be condensed. The main result: population density distribution, appears relatively late in the abstract.</i>		
3. There are a few grammatical errors and spelling mistakes in this article.		3
<i>Overall, the language is clear. There're several errors: an incomplete truncated sentence in section 3.3.1 a date discrepancy (2005 instead of 2008) in describing the growth of the Doufoura basin, inconsistent spelling (Doussama / Doussouma)!. and the mixing of a French term "Krigeage" within the English text in the keywords. It requires complete language editing and proofreading.</i>		

<i>Several passages appear to be direct translations from French into English and require professional language editing to ensure natural, fluent and academically appropriate English.</i>	
4. The study methods are explained clearly.	3
<p><i>The methodology is generally well explained (images, sources, digitization, mechanism, equation, spherical semivariogram model) but it takes a quantitative justification for choosing 5 individuals – Household despite its contradiction with the official census figure (4.1) the absence of any quantitative validation test (cross validation /RMSE) for the kriging model itself, and a lack of details regarding the field sample size. This section needs further quantitative studies.</i></p> <p><i>The manuscript is well structured, with clear and appropriate organization and section headings</i></p>	
5. The results are clear and do not contain errors.	4
<p><i>The numbers and densities are mathematically consistent upon verification (all the values in the tables are verified.</i></p> <p><i>An incomplete sentence that disrupts the narrative clarity in section 3.3.1</i></p> <p><i>("In 2008, the population density in the Manvouaka catchment area was This is thought to be due to the southern part of the area's proximity to the city centre.")</i></p>	
6. The conclusions or summary are accurate and supported by the content.	4
<p><i>The conclusion is coherent, does not exceed the boundaries of what the data supports and connects the results to similar local and regional literature (Essono Milla, Okanga Guay, Mihindou 2025) without exaggeration or unjustified conclusion.</i></p>	
7. The references are comprehensive and appropriate.	4
<p><i>The references are diverse, which is positive. However, the list needs cleaning up: a reference cited in the text does not appear in the list with the same data (Mihindou Mihindou 2004 vs 2025 in the list) three references are duplicated in two different formats each (dureau & Barbary, esri, Yagoub et al.) and three are at least two reference (Krivoruchko & Gribov 2019: Ongo Nko & Somon Song 2019) that are seemingly not cited in the text.</i></p> <p><i>Most of the in-text citations do not include page numbers, which weakens the accuracy and credibility of the referencing.</i></p>	

Overall Recommendation (mark an X with your recommendation) :

Accepted, no revision needed	
Accepted, minor revision needed	Accepted, minor revision needed

Return for major revision and resubmission	
Reject	

Comments and Suggestions to the Author(s):

Strengthening the Methodological Rigor

- Include a quantitative validation of the Kriging model (cross validation, RMSE, or another appropriate accuracy metric).
- Provide a clearer statistical or field – based justification for using 5 persones per household instead of the official census value of 4.1, including information on the field sample size and validation methodology.
- Discuss the impact of differences in the data sources and spatial resolution of the two images (orthophoto vs 2023 SAS planet – Maxar imagery) on the comparison of digitization results between the two periods.
- It is recommended to include page numbers for in-text citations, where applicable.