

REVIEWER'S REPORT

Manuscript No.: **IJAR-51685**

Date: 17.05.2025

Title: Study of the Thermal Behaviour of an Experimental Building at the National Research Centre for Development in Chad

Recommendation:

Accept after major revision

Rating	Excel.	Good	Fair	Poor
Originality			✓	
Techn. Quality			✓	
Clarity			✓	
Significance			✓	

Reviewer Name: Dr. K. ARUMUGANAINAR

Date: 17.05.2025

Reviewer's Comment for Publication.

(To be published with the manuscript in the journal)

The reviewer is requested to provide a brief comment (3-4 lines) highlighting the significance, strengths, or key insights of the manuscript. This comment will be Displayed in the journal publication alongside with the reviewers name.

Decision: Major Revisions Required

Justification: The study addresses a relevant and under-researched topic with sound experimental work. However, substantial improvements are needed in:

- Technical writing
- Data contextualization
- Analysis robustness
- Presentation clarity

With these improvements, the paper could be a strong contribution to sustainable construction and thermal comfort research in hot arid regions.

Detailed Reviewer's Report

“Study of the Thermal Behaviour of an Experimental Building at the National Research Centre for Development in Chad”

1. Summary of the Paper

This research investigates the thermal behavior of an experimental 24 m² office-type building (CABET cell) constructed with local materials in N'Djamena, Chad. The study aims to evaluate the cell's thermal performance under real climatic conditions using SHT75 and SHT35 hygrothermal sensors and a DAVIS Vantage Pro 2 weather station. Measurements were taken during April 2022—a hot summer period—to observe temperature and humidity variations across different layers of the building envelope (walls, roof, attic). The results show that the building fails to meet thermal comfort standards, with significant heat accumulation, especially in the attic due to poor insulation.

2. Evaluation Criteria

A. Novelty and Originality

- **Strengths:** The study is contextually original, addressing thermal comfort challenges in Chad's hot climate using local materials. The real-time, in-situ experimental approach is valuable, especially for regions lacking prior data.
- **Limitations:** While the topic is relevant, similar studies exist for hot climates; the originality lies more in the geographic and material context rather than the methodology.

B. Technical Quality and Methodology

- **Data Collection:** Well-documented use of sensors and data loggers to capture thermal behavior. The vertical and horizontal temperature gradients are thoughtfully analyzed.
- **Instrumentation:** The use of a variety of sensors is commendable. However, calibration and error analysis details are minimal.

- **Thermo-physical Characterization:** A basic material property table is provided, but lacks source references or test validation.

C. Results and Interpretation

- The study provides meaningful graphical and analytical results.
- Shows clear evidence of thermal discomfort, especially due to the poorly insulated roof.
- Stratification of temperature and relative humidity was well analyzed.
- **However**, the analysis could benefit from:
 - Statistical treatment (e.g., mean/variance, confidence intervals).
 - Comparative benchmarks with similar experimental buildings.

D. Language and Structure

- The paper is mostly clear, but contains grammatical errors and awkward phrasing (e.g., “bulted” instead of “built”, “cell in free evolution” which should be clarified).
 - Figures are appropriate but lack detailed captions and labeling in some cases.
 - Some graphs are overly dense and not always reader-friendly.
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3. Strengths

- Practical and relevant topic for sustainable construction in arid climates.
 - Experimental approach using real-time climatic conditions.
 - Focus on local materials, which adds socio-economic value.
 - Strong visual data representation through graphs and figures.
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4. Weaknesses and Areas for Improvement

- **Technical Writing:** Needs significant language polishing for clarity and professionalism.

- **Insufficient Modeling:** The study is purely experimental; including a simulation or analytical model (e.g., EnergyPlus or TRNSYS) could enhance the analysis.
 - **Limited Scope:** Results are based on just two days of observation. A longer measurement period would improve reliability.
 - **Lack of Mitigation Proposals:** While the problem is well-identified (thermal discomfort), proposed solutions are only briefly mentioned in the conclusion (passive techniques, vernacular design) without specifics.
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5. Suggestions for Improvement

1. **Improve English language usage** throughout the paper with professional editing.
 2. **Include more measurement days or seasonal analysis** for generalizability.
 3. **Add a discussion section** comparing results with other studies or thermal comfort guidelines.
 4. **Provide modeling or simulation** to complement experimental findings.
 5. **Propose actionable improvements** for future designs based on findings (e.g., insulation strategies, design modifications).
 6. **Explain technical terms** like “free evolution” more clearly for broader comprehension.
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6. Ethical and Referencing Review

- **References** are appropriately cited but somewhat limited in number and scope.
 - **Ethical considerations** (e.g., data integrity, calibration, reproducibility) are not explicitly addressed.
 - **No plagiarism or data manipulation observed** from the analysis.
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7. Overall Recommendation

Decision: Major Revisions Required

Justification: The study addresses a relevant and under-researched topic with sound experimental work. However, substantial improvements are needed in:

- Technical writing
- Data contextualization
- Analysis robustness
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With these improvements, the paper could be a strong contribution to sustainable construction and thermal comfort research in hot arid regions.
