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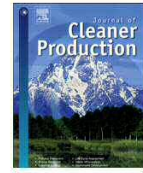
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A review on the factors influencing energy efficiency of mosque buildings



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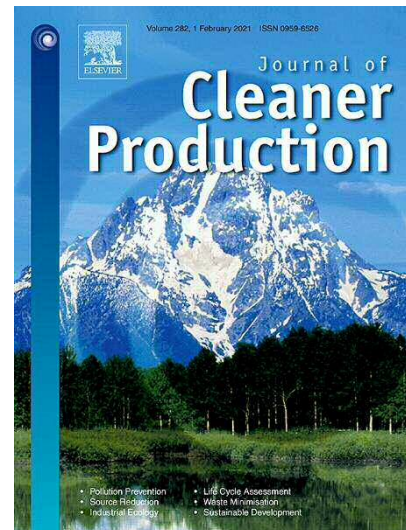
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A review on the factors influencing energy efficiency of mosque buildings

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Highlights

- A comprehensive review on energy performance of mosque buildings is presented.
- Factors influencing mosque energy efficiency are identified.
- Impacts of mosque design and operational parameters on energy usage are addressed.
- Critical analysis of energy optimization studies is presented.
- Numerous research gaps and scopes are identified for further research.

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1 **Abstract**

2 Mosques are external load dominated buildings that are characterized by their intermittent and
3 varying occupancy schedules. Most mosques employ some form of mechanical heating/cooling system
4 in order to maintain suitable thermal comfort conditions for the users during prayer times. Due to the
5 unique spatial characteristics and occupancy patterns of mosques, these systems are often found to be
6 energy-intensive which impacts the overall energy efficiency of the building. The inefficiency in
7 mosque energy usage has been typically attributed to the poor thermal performance of the buildings
8 along with unsuitable operational strategies for the occupancy schedule of mosques. This paper reviews
9 contemporary literature on mosque energy usage with an aim of identifying the factors that influence
10 the energy efficiency of mosque buildings. Findings from the literature have been categorized according
11 to different parameters of the building design as well as design and operational strategies of the
12 heating/cooling systems. Discussion on the common practice and best practice has also been done with
13 respect to thermal comfort standards and requirements. In addition to that, this paper compares and
14 critically evaluates the studies that have aimed at reducing energy consumption and improving energy
15 efficiency in mosques. Findings from multiple research suggest that as much as half of the energy usage
16 can be reduced with the optimization of building design and operational strategies of mosques. The
17 review of contemporary literature provides valuable insights into mosque energy usage patterns and
18 identifies the important aspects to be considered in reducing energy consumption in mosque buildings.
19 Through this literature review, numerous research gaps have been identified that may be pivotal in
20 designing energy efficient mosques. Based on those, future potential research prospects have also been
21 suggested.

22

23 **Keywords:** Energy efficiency; Thermal comfort; Thermal performance; Building design;
24 Intermittent occupancy; Operational strategy.

25

26 **Abbreviations:** HVAC, Heating, ventilation and air-conditioning; EUI, Energy usage intensity;
27 AC, Air-conditioning; BIM, Building information modeling; COP, Coefficient of performance; EER,
28 Energy efficiency ratio; EIR, Energy input ratio; BEM, Building energy modeling; ASHRAE,
29 American Society of Heating, Refrigerating and Air-Conditioning Engineers; CFD, Computational
30 fluid dynamics