Chapter 14
Enhancing Building Energy Efficiency Assessment Through Benchmarking Techniques

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ABSTRACT

This chapter explores the application of benchmarking techniques to assess and improve building energy efficiency. It highlights the limitations in accurately capturing the complex interplay of factors influencing building energy use. Potential of blending methodologies, including artificial intelligence integration, to overcome these challenges are discussed. Blending methods offer a holistic approach by integrating various benchmarking techniques to provide more precise assessments of energy performance. The chapter presents a detailed discussion on the benefits of blending methods, showcasing how they improve prediction accuracy, enhance flexibility, and adaptability in benchmarking processes. Additionally, a case study illustrates the effectiveness of blending methodologies in predicting building energy consumption, demonstrating significant error reductions compared to individual models. Overall, this chapter underscores the importance of adopting advanced benchmarking techniques to drive improvements in building energy efficiency.

DOI: 10.4018/979-8-3693-3200-9.ch014

INTRODUCTION

Building energy efficiency assessment is needed to protect the environment and build sustainable buildings; it plays a vital role in building energy performance and presents opportunities to optimise energy usage. The approach accounts for multi-dimensional factors like building envelope, HVAC efficiency, energy consumption patterns and occupants' behaviour (USAID ECO-III, 2008; S. Wang et al., 2012). The assessment, often called an energy audit, explains energy usage and identifies potential improvement areas. The audit thoroughly examines electrical components, end-use appliances, and the air quality of the building, including ventilation and fresh air flow. The examination process starts with the physical examination of the sites, like site transportation and nearby resources; it also covers the potential expenses and potential savings, and the final report outlines the areas where energy can be saved (Pérez-Lombard et al., 2009). The energy assessment is vital because of its power ability to project energy efficiency and reduce overall expenditures, including sustainable initiatives and promoting the indoor environment and thermal comfort interior. These initiatives also provide various benefits, such as savings, predictive maintenance, and benchmarking for continuous improvement. The assessment steps can be more potent if integrated with the last data and records that can build a robust toolkit for evaluating energy consumption in buildings and give an opportunity to users to make informed decisions that can contribute to a more sustainable future.

Building energy efficiency assessments heavily rely on benchmarking methodologies, which offer a framework for comparing energy performance to peers or set criteria. Using benchmarking, stakeholders may identify failing facilities, set reasonable energy usage goals, and track advancement over time. Additionally, benchmarking promotes continual development in energy efficiency within the construction sector by facilitating the exchange of knowledge and best practices. (Bogan Christopher B. & English Michael J., 1994). The energy consumption within buildings varies significantly based on factors such as floor area and the usage of end-use appliances, as depicted in Figure 1.