CHAPTER 1
BALANCING COMFORT AND SUSTAINABILITY IN BUILDINGS

Sheikh Ahmad Zaki and Samar Thapa

1.1 INTRODUCTION

The pursuit of sustainability in the built environment is a multifaceted challenge that intertwines energy conservation, thermal comfort, and architectural design (Altomonte et al., 2020). The buildings sector provides an opportunity to save a considerable amount of energy. However, dissatisfactions are often reported from the internal environments of a building (Thapa et al., 2016). The discussion in this editorial chapter delves into the themes presented in this book, "*Building Sustainability, Thermal Comfort, and Energy Efficiency*," which provides a comprehensive look at various studies addressing these interconnected issues.

By exploring diverse geographic contexts and methodologies, this volume offers valuable insights into how we can balance comfort and sustainability in residential and office buildings (Khalid et al., 2019).

1.2 INTEGRATING DIVERSE PERSPECTIVES

One of the primary strengths of this volume lies in its incorporation of diverse perspectives and contexts. By examining case studies from Malaysia, Japan, Turkey and tropical regions of Nigeria and Australia, the book highlights the unique challenges and opportunities that

different climates and cultures present. Each chapter offers a distinct lens through which we can understand the broader issues of energy use and thermal comfort, providing a holistic view of the built environments' complexities. For instance, the study on electricity consumption patterns in Malaysian houses illustrates how socioeconomic factors influence energy use and thermal comfort (Damiati et al., 2016). In contrast, the examination of thermal comfort zones in Japanese office buildings reveals the adaptability of mixed-mode (MM) systems compared to traditional Heating Ventilation and Air Conditioning (HVAC) systems (Taib et al., 2022).

Secondly, exploring smart living technologies highlight the transformative potential of innovation in enhancing thermal comfort and sustainability. Intelligent control systems, real-time monitoring, and user-centric design are pivotal elements that optimise energy use and improve the quality of life. The research on integrating smart technologies into residential and urban planning in Istanbul presents a proactive approach to managing energy consumption and fostering long-term behavioural changes towards more sustainable practices.

Moving ahead towards the advocacy for clean energy solutions, chapters focused on the tropics of Nigeria underscore the critical importance of sustainable energy solutions. Traditional active cooling systems, reliant on non-renewable sources, are increasingly unsustainable due to their environmental impact and contribution to global warming. The advocacy for passive ventilation techniques and renewable energy sources, such as solar and wind power, presents a viable alternative for achieving thermal comfort while minimising ecological footprints. In contrast, the investigation into cooling behaviours in Australian tropical climates challenges the one-size-fits-all assumptions of national energy rating schemes. By highlighting the diverse and adaptive cooling strategies residents employ, the study calls for more nuanced and context-specific approaches to energy assessment.

In the following sections, we present a brief overview of these chapters that form the ingredients of this volume.

1.2.1 Electricity and Indoor Environment in Malaysian Houses

A critical aspect of sustainable building practices is to understand the electricity consumption patterns. This study by Naja Aqilah, Hom Bahadur Rijal, and Fitri Yakub, which examines electricity consumption in Malaysian houses, provides an insightful analysis of how household income levels affect energy use. The research involved 19 dwellings and measured the electricity consumption of total household use and air-conditioner (AC) use alongside indoor air temperatures.

The study also highlights the peak demand periods for electricity. It identifies two critical peaks: one at night (19:00 ~ 01:00) primarily due to AC usage and another in the morning (05:00 ~ 09:00) due to the use of other appliances. This information is crucial for energy providers and policymakers, as it can inform strategies for demand management and energy conservation. For instance, promoting energy-efficient AC units or incentivising off-peak usage could mitigate these peaks.

Moreover, the study reveals that occupants can tolerate higher indoor air temperatures in living rooms than in the bedrooms. This finding has significant implications for energy savings, suggesting that cooling strategies can be tailored to different spaces within a home. For example, maintaining slightly higher temperatures in living rooms during the day and focusing cooling efforts on bedrooms at night could optimise energy use without sacrificing comfort.

These insights into electricity consumption patterns and indoor air temperatures provide a foundation for forecasting future energy demands. They also highlight the importance of encouraging energy-efficient behaviours and technologies, particularly in the context of air conditioning, which significantly contributes to household energy use.

1.2.2 Thermal Comfort Zone in Japanese Office Buildings

The quest for thermal comfort in office environments is another crucial aspect of sustainable building practices (Izzati et al., 2023).