

Sustainability Assessment of Perovskite Solar Cells

Application for Emergency Shelters

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Abstract

Concise summary of objectives, methods, key findings, and conclusions. Will do last.

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1 Introduction

This study conducts a comprehensive sustainability assessment of emergency shelter tents¹, examining their environmental footprint, economic viability, socio-environmental trade-offs, and social implications. Focusing on energy systems, the most widely-used shelter technologies in disaster response scenarios are analyzed and compared.

1.1 Justification for Selection

Natural disasters are a significant global issue, affecting over 100 countries each year. More than 200 million people are impacted annually by natural disasters, and on average, 20 to 40 million people require temporary shelters (Alves, B., 2014). The ability to provide timely, efficient, and sustainable shelter in such situations is critical, making the assessment of emergency shelter technologies highly relevant.

The focus of this study is on comparing emergency shelter power solutions to understand their implications for both disaster relief efforts and sustainability goals.

1.2 Product Selection and Justification

This assessment compares three distinct emergency shelter power solutions:

- **Perovskite-integrated shelters:** The primary focus, representing an emerging technology with potential advantages in efficiency and manufacturing cost compared to conventional options.
- **Silicon solar-equipped shelters:** Serving as the baseline renewable alternative, with established performance data and widespread deployment in field operations.
- **Diesel generator systems:** Representing conventional power solutions for shelters in grid-independent scenarios, despite their known environmental drawbacks.

This selection encompasses both mature and emerging technologies to provide a balanced perspective on sustainability trade-offs in disaster response applications.

The importance of this study is underscored by the global prevalence of natural disasters. Each year, more than 100 countries experience the devastating effects of such disasters, impacting over 200 million people worldwide annually. On average, between 20–40 million people require temporary shelters in the aftermath of these events (Alves, B., 2014).

Given this scale, effective and sustainable emergency shelter solutions are critical in mitigating the challenges faced by disaster-affected populations. By evaluating the sustainability of shelter technologies, this study aims to contribute to improving the resilience of disaster response efforts globally.

¹ An emergency shelter tent is a portable structure, often lightweight and easy to set up, designed to provide temporary protection from the elements in emergency situations. It offers a safe and sheltered space, especially in scenarios where traditional housing is unavailable or inadequate, as noted by Gala Tent (2024) and ICBrintle (2022)

text

2 References

1. GalaTent (2024). *Emergency Medical Tents and Shelters*. [online] Available at: <https://www.galatent.co.uk/uses/emergency-medical-tents-and-shelters>.
2. ICBrindle (2022). *Rapid Deployment Inflatable Emergency Shelters*. [online] Available at: <https://icbrindle.com/rapid-response-inflatable-shelters/inflatable-emergency-shelters-tents.html>.
3. Alves, B., (2014). *Topic: Natural disasters*. [online] www.statista.com. Available at: <https://www.statista.com/topics/2155/natural-disasters/>