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Assessing the Sustainability Risk Factors of Post-Disaster Temporary Housing: A Conceptual Framework

Afet Sonrası Geçici Konutların Sürdürülebilirlik Risk Faktörlerinin Değerlendirilmesi: Kavramsal Bir Çerçeve

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Öne Çıkanlar / Highlights

▪ Afet sonrası geçici konutlarda sürdürülebilirlik risklerinin tematik olarak belirlenmesi	▪ Thematic identification of sustainability risks in post-disaster temporary housing
▪ Dört tematik grupta 24 risk faktörünün sıklık bazında değerlendirilmesi	▪ Frequency-based assessment of 24 risk factors across four thematic groups
▪ Sürdürülebilir planlama ve karar almayı destekleyen kavramsal çerçeve	▪ Conceptual framework supporting sustainable planning and decision-making

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Abstract

Disasters, whether natural or man-made, underscore the urgent demand for effective temporary housing solutions. Post-disaster temporary housing is crucial for providing quick response and shelter, but it also presents several risks related to sustainability principles. In this study, the sustainability risks of temporary housing practices are identified through a comprehensive literature review and organized thematically. In this context, 23 papers found through a keyword search in the Web of Science database between 2016 and 2025 were analyzed using thematic analysis. During the literature review process, each risk theme was categorized by frequency based on the number of publications that referenced it. The numerical density calculated shows the prominence of these risks in the literature. Consistent with the findings, the risks were grouped into four main themes: (i) environmental, (ii) economic, (iii) social, and (iv) organizational. The study aims to assist in reevaluating post-disaster temporary housing strategies from a sustainability perspective and to provide a data-driven foundation for developing design strategy processes.

Anahtar Kelimeler

Afet Sonrası
Geçici Barınma
Sürdürülebilirlik

Özet

Doğal veya insan kaynaklı afetler, etkili geçici barınma çözümlerine olan acil ihtiyacı vurgulamaktadır. Afet sonrası geçici barınma, hızlı müdahale ve barınak sağlamak için çok

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Risk
Tematik Analiz

önemlidir, ancak sürdürülebilirlik ilkeleriyle ilgili çeşitli riskler de barındırmaktadır. Bu çalışmada, geçici barınma uygulamalarının sürdürülebilirlik riskleri kapsamlı bir literatür taraması yoluyla belirlenmiş ve tematik olarak düzenlenmiştir. Bu bağlamda, 2016 ile 2025 yılları arasında Web of Science veritabanında anahtar kelime araması yapılarak bulunan 23 makale tematik analiz kullanılarak incelenmiştir. Literatür taraması sürecinde, her bir risk teması, ona atıfta bulunan yayınların sayısına göre sıklıklarına göre kategorize edilmiştir. Hesaplanan sayısal yoğunluk, bu risklerin literatürdeki önemini göstermektedir. Bulgularla tutarlı olarak, riskler dört ana tema altında gruplandırılmıştır: (i) çevresel, (ii) ekonomik, (iii) sosyal ve (iv) örgütsel. Çalışma, afet sonrası geçici barınma stratejilerinin sürdürülebilirlik perspektifinden yeniden değerlendirilmesine yardımcı olmayı ve tasarım stratejisi süreçlerinin geliştirilmesi için veriye dayalı bir temel sağlamayı amaçlamaktadır.

1. INTRODUCTION

Natural disasters continue to pose significant global challenges, displacing millions of people each year. Since 2008, about 22.5 million people have lost their homes annually due to disasters, highlighting the urgent need for effective and sustainable housing solutions (Hosseini, Pons, et al., 2020). The transition from immediate emergency relief to returning to permanent housing typically takes several years, during which affected populations live in temporary housing units (Hosseini et al., 2021, 2022; Hosseini, Yazdani, et al., 2020). This sequential accommodation process is shown in Figure 1.

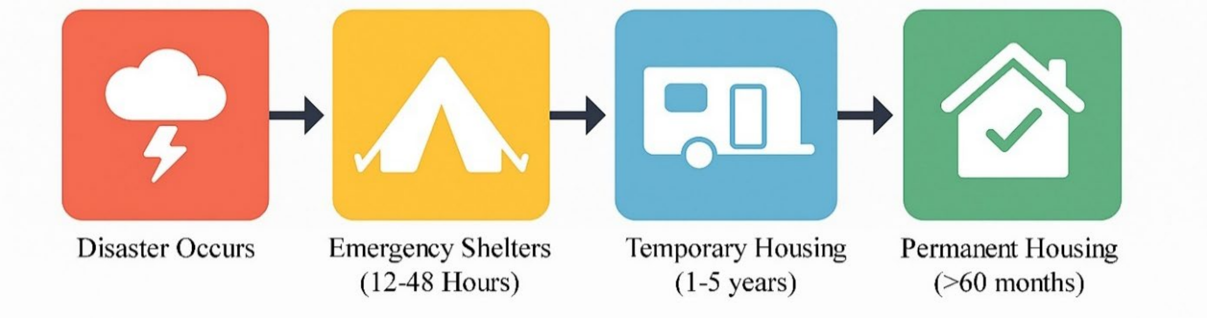

Figure 1. *Post-Disaster Accommodation Timeline*

As shown in Figure 1, emergency shelters typically provide collective accommodation during the first 12–48 hours following a disaster. In the subsequent weeks, there is a transition toward temporary housing, where victims may reside for up to five years before accessing permanent housing solutions (Montalbano & Santi, 2023). Planning for this transitional phase is critical for ensuring social stability, infrastructure continuity, and long-term recovery.

Temporary housing (TH) serves as a critical bridge between emergency shelters and permanent housing. To fulfill its role effectively, TH must not only be deployed rapidly but also provide safety, privacy, thermal comfort, and support for rebuilding daily routines (Afkhamiaghda et al., 2021; Perrucci et al., 2025). Additionally, TH must adhere to sustainability principles—minimizing environmental impact, conserving resources, and supporting long-term community resilience (Félix et al., 2013). This is particularly important given the long-term ecological footprint associated with material choices, energy consumption, and construction and demolition waste (A. Atmaca & Atmaca, 2016; Song et al., 2016).

Although there is an increasing amount of research focused on the design and implementation of TH solutions, limited studies have rigorously investigated the sustainability-related concerns associated with these systems. Several studies have employed various evaluation approaches, including multi-criteria decision-making (MCDM) tools (Hosseini et al., 2022) life cycle assessment (LCA), and simulation-based models to analyze sustainability measures (A. Atmaca & Atmaca, 2016; Song et al., 2016). Nonetheless, a thorough risk-based perspective—particularly within the sustainability framework of post-disaster temporary housing (PDTH)—is predominantly lacking.

This study aims to systematically identify, categorize, and prioritize risks associated with sustainability in temporary housing following disasters. It employs a thematic and frequency-based analysis of peer-reviewed literature to inform the development of more resilient, resource-efficient, and adaptable housing strategies tailored to diverse contexts. The findings aim to inform policymakers, designers, and practitioners in making informed decisions that enhance the long-term viability and social acceptance of temporary housing solutions.

2. METHODOLOGY

The research design uses a sequential mixed-methods approach, combining both qualitative and quantitative methods for data collection and analysis. Specifically, the study employs thematic analysis in conjunction with frequency-based evaluation to identify and characterize sustainability risks associated with post-disaster temporary housing. Thematic analysis allows for the systematic identification and interpretation of recurring patterns in the literature. Meanwhile, frequency analysis measures the prominence of each risk factor, helping to develop a structured risk taxonomy. This integrated approach forms the basis of the conceptual framework presented in the study. The research process consisted of three main stages, as illustrated in Figure 2.

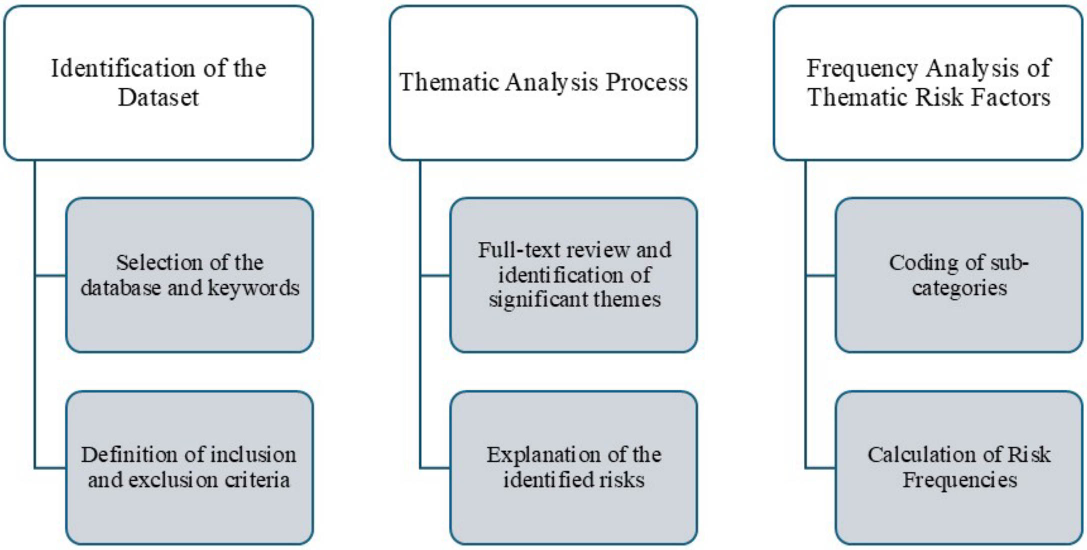

Figure 2. *Conceptual Framework of the Research*

2.1. Identification of Dataset

2.1.1 Selection of Database and Keywords

The first part of the study involved choosing a database to collect high-quality data for thematic analysis. Within the scope of this study, a comprehensive literature review was conducted using the Web of Science (WoS) database to identify sustainability risk factors associated with post-disaster temporary housing. WoS employs advanced citation-matching algorithms that outperform Scopus, confirming its suitability as the primary data source for this research (Valderrama-Zurián et al., 2015). The search string used in the WoS core collection database is as follows:

ALL FIELDS = "post-disaster temporary hous*" OR "post disaster temporary hous*" AND "post-disaster temporary shelter*" OR "post disaster temporary shelter*" AND "post-earthquake temporary hous*" OR "post earthquake temporary hous*" AND "post-earthquake temporary shelter*" OR "post earthquake temporary shelter*" AND “sustainabil*” AND “risk*”. The character "*" denotes a wildcard search to identify more relevant term variations.

2.1.2 Definition of Inclusion and Exclusion Criteria

The literature search, conducted in June 2025, identified 23 relevant papers. Following methodological rigor, conference proceedings, books, and book chapters were excluded from the analysis due to widespread concerns about the inadequate peer-review processes typically associated with these types of publications. The inclusion criteria were explicitly defined as follows: (1) research specifically focused on risks related to post-disaster sustainability, (2) articles published in peer-reviewed academic journals, (3) publications listed in the SCI-E, SSCI, or AHCI databases, and (4) publications from the last 10 years. This source selection strategy is essential for ensuring the reliability and academic integrity of the findings, as articles meeting these criteria are generally recognized for their methodological rigor and scholarly reputation (Shi et al., 2020).

2.2 Thematic Analysis Process

2.2.1 Identification of risk factors

Following the literature search, 23 publications related to the topic were identified. In the next step, the authors thoroughly reviewed the selected publications and identified 24 risk factors grouped into four main themes. These themes were organized based on their conceptual similarity, contextual relevance, and common patterns in the literature. The coding process facilitated the grouping of similar risk statements into relevant subcategories, thereby clarifying understanding across studies (Braun & Clarke, 2006). Additionally, this categorization enabled a systematic synthesis of the data and facilitated a more comprehensive evaluation of interconnected risk areas.

Table 1. *Code of Themes*

Coded	Theme
EN	Environmental
EC	Economic
SO	Social
OP	Operational

The identified risk factors were explained in Tables 2, 3, 4, and 5. The descriptions in the tables reflect the contextual meanings of each risk and its implications for temporary housing following disasters. This detailed classification serves as the basis for the subsequent frequency analysis and the development of an evaluation framework.

Table 2. *Environmental Risk Factors of PDTH*

Coded	Risk Factors	Interpretation
EN1	High Carbon Footprint	The development, delivery, and installation of temporary housing units generate significant carbon emissions. Reinforced concrete and steel structures require the use of fossil fuels during their manufacturing process.
EN2	Energy Inefficiency	Uninsulated or climate-unsuitable structures require more heating/cooling, which increases energy consumption over time.
EN3	Use of Non-Recyclable Materials	Insufficient reuse or recycling of materials harms the environment.
EN4	Waste Management Problems	Building material waste from the removal of temporary structures without a recovery strategy is a significant environmental issue.
EN5	Overuse of Natural Resources	Long-distance sourcing of commodities like timber, cement, and metal wastes natural resources and stresses ecosystems.
EN6	Lack of Adaptation to Climate Conditions	Unsuitable designs (e.g., poor ventilation in hot locations) impair sustainability.

Table 3. *Economic Risk Factors of PDTH*

Coded	Risk Factors	Interpretation
EC1	High Life Cycle Cost	Designing, building, maintaining, and dismantling temporary lodging units is expensive and unsustainable.
EC2	Overestimation of Operation and Maintenance Costs	Decision-makers often overlook running costs, such as energy and maintenance, in favor of the original investment cost.
EC3	Resource Constraints	In developing countries, inadequate budget allocation for temporary housing harms the quality and sustainability of projects.
EC4	Lack of Cost-Effectiveness	Uneconomic planning for user needs, local materials, and durability.
EC5	Low Potential for Reuse of Temporary Structures	Economic waste occurs when buildings cannot be reused.

EC6	Unpredictable Demand and Inventory Management Challenges	The unpredictable demand for shelter units makes it hard to plan manufacturing and logistics, resulting in economic inefficiencies.

Table 4. *Social Risk Factors of PDTH*

Coded	**Risk Factors**	Interpretation
SO1	Cultural Inappropriateness	User alienation and adaptation issues arise from house designs that do not align with local cultural norms and living patterns.
SO2	Lack of Privacy	A crowded layout, thin walls, communal restrooms, and kitchens compromise privacy, causing stress to users.
SO3	Psychological Health Problems	Long-term temporary housing can harm mental health due to unpredictability, solitude, and stress. This condition poses a significant risk to seniors, women, and children.
SO4	Weakening of Social Ties	Temporary housing disrupts community structure and social solidarity, making social integration difficult.
SO5	User Dissatisfaction	Without user feedback on housing units, social cohesion and user experience suffer.
SO6	Social Inequalities	Social sustainability is threatened by housing distribution injustice or neglect of underprivileged communities.

Table 5. *Operational Risk Factors of PDTH*

Coded	**Risk Factors**	Interpretation
OP1	Lack of Coordination Among Authorities	Ambiguities in task delineation among governmental agencies, NGOs, the private sector, and local administrations lead to significant issues.
OP2	Unplanned Land Allocation Processes	Site selection and infrastructure installation are hindered by ownership issues or a shortage of temporary residential accommodations.
OP3	Prime and Political Uncertainties	The sustainability of the project is jeopardized by temporary constructions evolving into permanent fixtures, coupled with their uncertain legal status.
OP4	Lack of Long-Term Strategic Plan	Temporary housing is often established as an immediate response, thereby neglecting sustainability and long-term planning.
OP5	Lack of Institutional Capacity	A lack of technical, administrative, or financial capacity among local governments hinders and lowers the quality.
OP6	Inadequacy of Data-Based Decision Mechanisms	Lack of data-driven decision support hinders successful planning throughout site selection, distribution, and needs determination.

2.3 Frequency Analysis of Sustainable Risk Factors

After identifying and categorizing sustainable risk factors of PDTH, a frequency analysis was performed to measure the focus on each sub-category in the reviewed literature.

2.3.1 Calculation of Risk Frequencies

A frequency analysis was conducted at this stage to determine the frequency at which the risk factors appeared in the literature. To do this, qualitative data were transformed into numerical data by counting the number of times each of the 24 risk factors mentioned in 23 studies from the literature review occurred. Additionally, these counts were converted into percentages to facilitate easier comparisons. These quantitative measures offer an empirical basis for assessing the relative importance of each risk factor in academic discussions.

Table 6 presents the frequency analysis of sustainability risk factors associated with post-disaster temporary housing. The references not only confirm the existence of these risks but also emphasise the diversity of contexts in which they are studied.

Table 6. *Frequency of Risk Factors and References Used*

Factor Code	Frequency	Per cent (%)	References
EN1	14	60,87	(Afkhamiaghda et al., 2021; A. Atmaca & Atmaca, 2016; N. Atmaca, 2017; Avlar et al., 2023; Biswas, 2019; Biswas & Puriya, 2020; Bologna, 2020; Hosseini, De La Fuente, et al., 2016; Hosseini, de la Fuente, et al., 2016; Hosseini et al., 2021, 2022; Hosseini, Pons, et al., 2020; Hosseini, Yazdani, et al., 2020; Reza Mojahedi et al., 2021)
EN2	14	60,87	(Afkhamiaghda et al., 2021; A. Atmaca & Atmaca, 2016; N. Atmaca, 2017; Avlar et al., 2023; Biswas, 2019; Biswas & Puriya, 2020; Hosseini, De La Fuente, et al., 2016; Hosseini, de la Fuente, et al., 2016; Hosseini et al., 2021, 2022; Hosseini, Pons, et al., 2020; Hosseini, Yazdani, et al., 2020; Reza Mojahedi et al., 2021; Song et al., 2016)
EN3	11	47,83	(Afkhamiaghda et al., 2021; A. Atmaca & Atmaca, 2016; N. Atmaca, 2017; Avlar et al., 2023; Biswas, 2019; Biswas & Puriya, 2020; Hosseini, De La Fuente, et al., 2016; Hosseini et al., 2021; Hosseini, Pons, et al., 2020; Hosseini, Yazdani, et al., 2020; Reza Mojahedi et al., 2021)
EN4	13	56,52	(Afkhamiaghda et al., 2021; A. Atmaca & Atmaca, 2016; N. Atmaca, 2017; Avlar et al., 2023; Biswas, 2019; Biswas & Puriya, 2020; Bologna, 2020; Hosseini, De La Fuente, et al., 2016; Hosseini, de la Fuente, et al., 2016; Hosseini et al., 2021, 2022; Hosseini, Pons, et al., 2020; Hosseini, Yazdani, et al., 2020)
EN5	13	56,52	(Afkhamiaghda et al., 2021; A. Atmaca & Atmaca, 2016; N. Atmaca, 2017; Avlar et al., 2023; Biswas, 2019; Biswas & Puriya, 2020; Hosseini, De La Fuente, et al., 2016; Hosseini, de la Fuente, et al., 2016; Hosseini et al., 2021, 2022; Hosseini, Pons, et al., 2020; Hosseini, Yazdani, et al., 2020; Reza Mojahedi et al., 2021)
EN6	13	56,52	(Afkhamiaghda et al., 2021; A. Atmaca & Atmaca, 2016; N. Atmaca, 2017; Avlar et al., 2023; Biswas, 2019; Biswas & Puriya, 2020; Hosseini, De La Fuente, et al., 2016; Hosseini, de la Fuente, et al., 2016; Hosseini et al., 2021, 2022; Hosseini, Pons, et al., 2020; Hosseini, Yazdani, et al., 2020; Reza Mojahedi et al., 2021)
EC1	15	65,22	(Afkhamiaghda et al., 2021; A. Atmaca & Atmaca, 2016; N. Atmaca, 2017; Avlar et al., 2023; Biswas, 2019; Biswas & Puriya, 2020; Bologna, 2020; Hosseini, De La Fuente, et al., 2016; Hosseini, de la Fuente, et al., 2016; Hosseini et al., 2021, 2022; Hosseini, Pons, et al., 2020; Perrucci & Baroud, 2020, 2021; Song et al., 2016)
EC2	6	26,09	(A. Atmaca & Atmaca, 2016; N. Atmaca, 2017; Biswas & Puriya, 2020; Perrucci & Baroud, 2020, 2021; Song et al., 2016)
EC3	15	65,22	(N. Atmaca, 2017; Avlar et al., 2023; Biswas & Puriya, 2020; Bologna, 2020; Hosseini, De La Fuente, et al., 2016; Hosseini, de la Fuente, et al., 2016; Hosseini et al., 2022; Hosseini, Pons, et al., 2020; Hosseini, Yazdani, et al., 2020; Oggioni et al., 2016; Perrucci & Baroud, 2020, 2021; Perrucci et al., 2025; Song et al., 2016; Wang et al., 2022)
EC4	15	65,22	(Afkhamiaghda et al., 2021; A. Atmaca & Atmaca, 2016; N. Atmaca, 2017; Avlar et al., 2023; Biswas, 2019; Biswas & Puriya, 2020; Hosseini, De La Fuente, et al., 2016; Hosseini, de la Fuente, et al., 2016; Hosseini et al., 2021, 2022; Hosseini, Pons, et al., 2020; Hosseini, Yazdani, et al., 2020; Perrucci & Baroud, 2020, 2021; Song et al., 2016)
EC5	15	65,22	(Afkhamiaghda et al., 2021; A. Atmaca & Atmaca, 2016; N. Atmaca, 2017; Avlar et al., 2023; Biswas, 2019; Biswas & Puriya, 2020; Bologna, 2020; Hosseini, De La Fuente, et al., 2016; Hosseini, de la Fuente, et al., 2016; Hosseini et al., 2021; Hosseini, Pons, et al., 2020; Hosseini, Yazdani, et al., 2020; Perrucci & Baroud, 2020, 2021; Song et al., 2016)

EC6	8	34,78	(Biswas & Puriya, 2020; Hosseini, Pons, et al., 2020; Oggioni et al., 2016; Perrucci & Baroud, 2020, 2021; Perrucci et al., 2025; Wang et al., 2022; Watanabe & Maruyama, 2021)
SO1	8	34,78	(Biswas, 2019; Biswas & Puriya, 2020; Bris & Bendito, 2019; Hosseini, De La Fuente, et al., 2016; Oggioni et al., 2016; Reza Mojahedi et al., 2021; Sukhwani et al., 2021; Watanabe & Maruyama, 2021)
SO2	7	30,43	(Biswas, 2019; Biswas & Puriya, 2020; Bris & Bendito, 2019; Oggioni et al., 2016; Reza Mojahedi et al., 2021; Sukhwani et al., 2021; Watanabe & Maruyama, 2021)
SO3	6	26,09	(Biswas, 2019; Biswas & Puriya, 2020; Bris & Bendito, 2019; Oggioni et al., 2016; Sukhwani et al., 2021; Watanabe & Maruyama, 2021)
SO4	5	21,74	(Biswas & Puriya, 2020; Bris & Bendito, 2019; Oggioni et al., 2016; Sukhwani et al., 2021; Watanabe & Maruyama, 2021)
SO5	14	60,87	(Afkhamiaghda et al., 2021; Biswas, 2019; Biswas & Puriya, 2020; Bris & Bendito, 2019; Hosseini, De La Fuente, et al., 2016; Hosseini et al., 2021; Hosseini, Pons, et al., 2020; Hosseini, Yazdani, et al., 2020; Oggioni et al., 2016; Perrucci & Baroud, 2020; Reza Mojahedi et al., 2021; Song et al., 2016; Sukhwani et al., 2021; Watanabe & Maruyama, 2021)
SO6	8	34,78	(Biswas, 2019; Biswas & Puriya, 2020; Bris & Bendito, 2019; Hosseini, De La Fuente, et al., 2016; Hosseini et al., 2021; Oggioni et al., 2016; Sukhwani et al., 2021; Watanabe & Maruyama, 2021)
OP1	11	47,83	(Biswas, 2019; Biswas & Puriya, 2020; Bologna, 2020; Bris & Bendito, 2019; Hosseini et al., 2022; Hosseini, Pons, et al., 2020; Oggioni et al., 2016; Perrucci & Baroud, 2020, 2021; Perrucci et al., 2025; Wang et al., 2022)
OP2	5	21,74	(Biswas, 2019; Biswas & Puriya, 2020; Hosseini, de la Fuente, et al., 2016; Hosseini et al., 2022; Oggioni et al., 2016)
OP3	5	21,74	(Biswas, 2019; Biswas & Puriya, 2020; Hosseini, de la Fuente, et al., 2016; Hosseini et al., 2022; Oggioni et al., 2016)
OP4	9	39,13	(Biswas, 2019; Biswas & Puriya, 2020; Bologna, 2020; Hosseini et al., 2022; Oggioni et al., 2016; Perrucci & Baroud, 2020, 2021; Wang et al., 2022; Watanabe & Maruyama, 2021)
OP5	12	52,17	(Biswas, 2019; Biswas & Puriya, 2020; Bologna, 2020; Hosseini, De La Fuente, et al., 2016; Hosseini, de la Fuente, et al., 2016; Hosseini et al., 2022; Hosseini, Pons, et al., 2020; Oggioni et al., 2016; Perrucci & Baroud, 2020, 2021; Perrucci et al., 2025; Wang et al., 2022)
OP6	10	43,48	(Biswas & Puriya, 2020; Bris & Bendito, 2019; Hosseini, De La Fuente, et al., 2016; Hosseini, de la Fuente, et al., 2016; Hosseini et al., 2022; Hosseini, Pons, et al., 2020; Oggioni et al., 2016; Perrucci & Baroud, 2020; Perrucci et al., 2025; Wang et al., 2022)

3. RESULTS

3.1 Identification of the most frequently cited risk factors

The frequency analysis revealed a set of risk factors that consistently appeared throughout the reviewed literature, as shown in Figure 3. Of the 24 identified risks, those related to economic sustainability—such as low potential for reuse (EC5), lack of cost-effectiveness (EC4), resource constraints (EC3), and high life cycle costs (EC1)—were the most frequently mentioned, each appearing in 15 different studies. This was followed by user dissatisfaction (SO5), energy inefficiency (EN2), and a high carbon footprint (EN1), each with a frequency of 14. Environmental risks, like a lack of climate adaptation (EN6), overuse of natural resources (EN5), and waste management problems (EN4), were also common, with 13 mentions each, along with institutional weaknesses including a lack of capacity (OP5) and coordination issues (OP1). In addition to these highly cited risks, others, such as lack of data-driven decision-making (OP6), inadequate long-term strategic planning (OP4), and social inequalities (SO6), received moderate attention, showing the broad range of sustainability challenges. Less frequently discussed but still significant issues included lack of privacy (SO2), psychological health issues (SO3), and unplanned land allocation processes (OP2). While these risks were less frequently reported in publications, their presence highlights the diversity of contexts and situations within the field. This variation suggests that although some risks are universally acknowledged, others may become more important depending on the specific disaster, geographic region, or institutional setting. As a result, risk prioritization should be based on evidence and tailored to the context to make sustainability efforts in temporary housing both practical and inclusive.

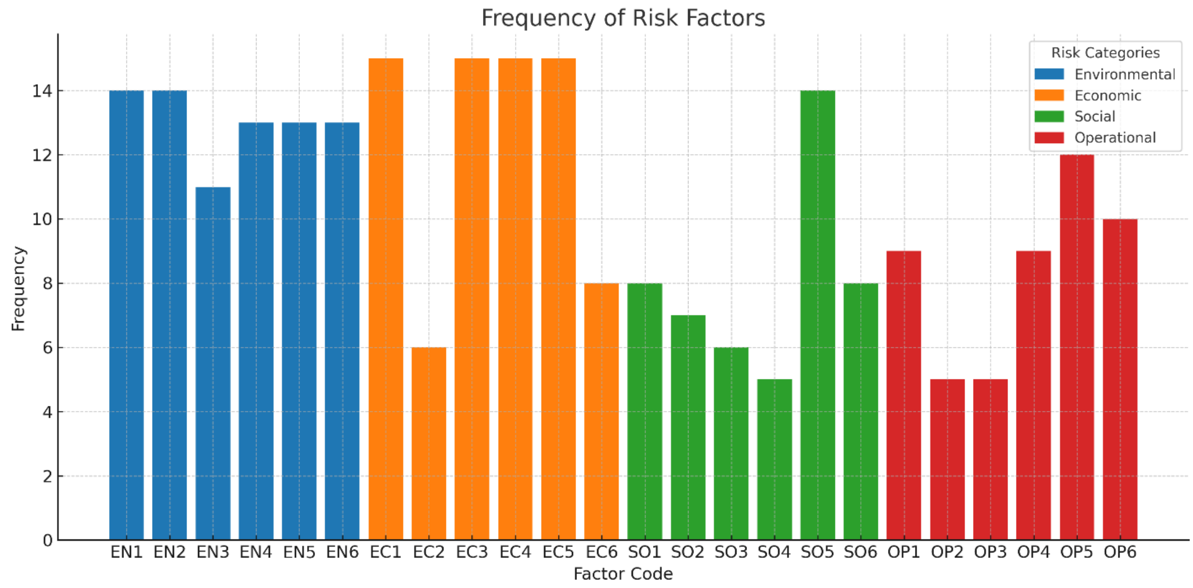

Figure 3. *The Most Frequently Cited Risk Factors*

The frequency analysis of sustainable risk factors in PDTH, as presented in Table 6, provides a crucial empirical basis for developing an evaluation framework. However, as shown in Figure 3, although the central theme, which includes economic risk factors, contains four factors with the highest frequency, a comparison of the main themes reveals that the theme with the highest overall frequency is "Environmental". This is illustrated in Figure 4.

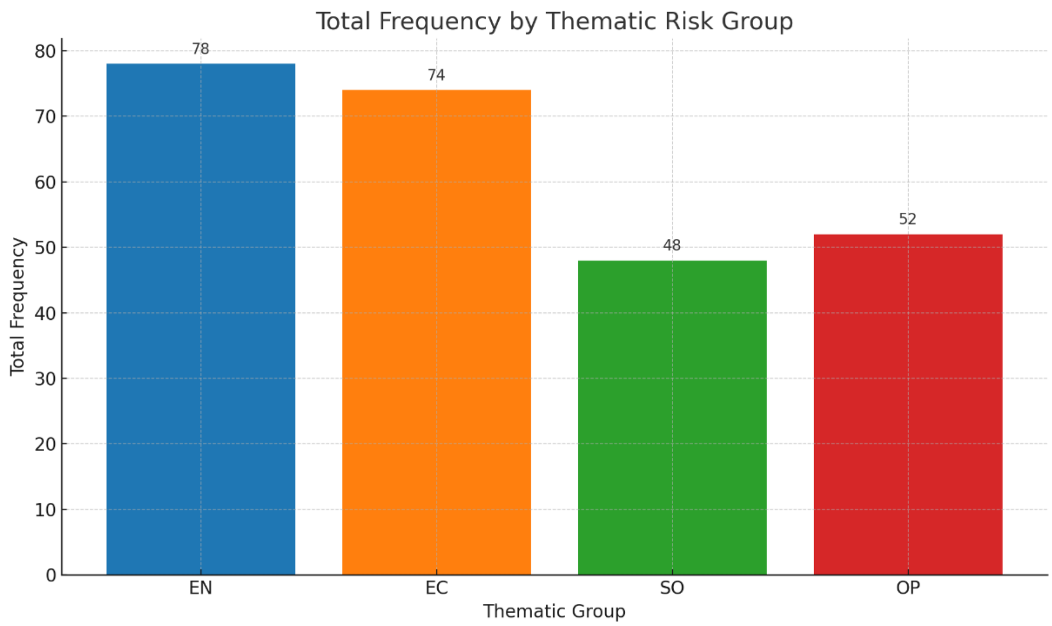

Figure 4. *Cumulative Risk Occurrence by Thematic Group*

Also, to enhance interpretability, four thematic categories of prominence are depicted in the 100% stacked bar chart in Figure 5. This thematic distribution indicates that environmental (31.0%) and economic (29.4%) risks are the most dominant in academic discussions, while organizational (20.6%) and social (19.0%) risks, although still significant, are relatively less emphasized. The quantitative insights highlight both key areas of concern and potential gaps in academic focus, especially concerning the social implications of temporary housing interventions.

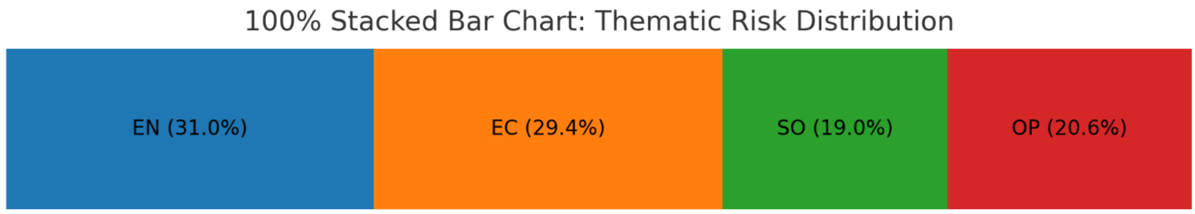

Figure 5. *100% Stacked Bar Chart: Thematic Risk Distribution*

4. DISCUSSION

This study aimed to identify and prioritize sustainability-related risk factors in post-disaster temporary housing (PDTH) through a theme and frequency analysis of peer-reviewed literature. The results highlight significant environmental, social, economic, and operational risks that threaten the sustainability of PDTH, emphasizing key shortcomings in planning, design, and implementation processes. These findings align with and expand upon existing literature by offering a systematic overview of common sustainability challenges and placing them within a cohesive analytical framework.

4.1 Interpretation of Findings in the Context of Existing Literature

Environmental risks scored between 11 and 14 points, highlighting their significant role in assessing the sustainability risks associated with PDTH. Among these risks, High Carbon Footprint (EN1) and Energy Inefficiency (EN2) were the most commonly mentioned issues. These results align with those of Montalbano and Santi (2023), who note that environmental performance in temporary housing units (THUs) is often overlooked in favor of speed and cost savings. Similarly, Biswas (2019) and Atmaca (2017) demonstrate through life cycle assessments (LCA) that most THUs have a significant environmental impact due to poor thermal insulation, a lack of renewable energy use, and poor material choices. Pomponi et al. (2019) also argue that the absence of circular strategies—like design for disassembly and reuse—limits the sustainability of THUs. Despite worldwide efforts to promote low-carbon and resource-efficient disaster recovery, environmentally friendly practices are often still a secondary concern in most cases. The urgency of post-disaster construction sometimes leads to the neglect of environmental standards, with a tendency to use high-emission materials and materials with poor thermal performance in order to save time and money.

Economic sustainability risks emerged as the most prominent group, with four of the six risks (EC1, EC3, EC4, EC5) receiving the maximum frequency score of 15. This highlights the widespread concern over the cost-efficiency and financial viability of temporary housing interventions. Examining economic risks reveals that these high-frequency scores reflect structural issues such as high life-cycle costs (EC1), resource constraints (EC3), lack of cost-effective planning (EC4), and limited potential for reuse (EC5). These findings support earlier studies criticizing the short-term focus in PDTH, where initial cost considerations often overshadow long-term performance and adaptability (Hosseini, De La Fuente, et al., 2016; Reza Mojahedi et al., 2021).

In the social risk dimension, SO5 (User Dissatisfaction) stands out with a frequency of 14, while all other social risks range between 5 and 8. These significant differences suggest that, although social sustainability is often viewed as a broad category, there is a growing recognition of one specific issue: the consistent neglect of user expectations and needs in the design and implementation of temporary housing. The high frequency of SO5 highlights a critical gap in participatory planning, as emphasized in multiple studies that advocate for user-centered, culturally appropriate, and adaptable housing solutions (Avlar et al., 2023; Shrestha & Orchiston, 2023; Tsai et al., 2022). Conversely, a lower score for SO4 (Weakening of Social Ties), which indicates difficulties with community structure and social solidarity, may suggest that specific social concerns—such as privacy, cultural mismatch, and social fragmentation—are either underreported or categorized under the broader issue of dissatisfaction. This reveals a gap in detail in current assessments and indicates that more precise social indicators are necessary in future sustainability evaluations.

Operational risks showed a more balanced frequency distribution. OP5 (Lack of Institutional Capacity) and OP1 (Lack of Coordination Among Authorities) were the most cited, with 12 and 11 mentions, respectively. These findings align with the literature, which highlights fragmented institutional frameworks, unclear responsibilities, and capacity limitations as major obstacles in disaster recovery (Hosseini et al., 2021). In contrast, OP2 (Unplanned Land Allocation Processes) and OP3 (Prime and Political Uncertainties) appeared less frequently, each with five mentions. This difference likely reflects researchers' focus on more visible, technical challenges, such as site coordination and administrative issues, while less explored, systemic, and politically sensitive problems are less explored due to data limitations or institutional barriers.

4.2 Theoretical and Practical Implications

This study highlights that achieving sustainability in PDTH requires shifting from reactive, short-term solutions to proactive, integrated strategies that address environmental, economic, social, and operational factors from the beginning. The findings support existing conceptual frameworks that promote context-sensitive, user-centered, and life-cycle–oriented approaches (Montalbano & Santi, 2023). Additionally, the thematic prioritization and frequency analysis in this study offer a replicable model for risk-informed planning and decision-making in PDTH environments.

Practically, the results emphasize the need for tools that facilitate evidence-based decision-making. Identifying high-frequency risk factors can also assist in developing sustainability assessment checklists or performance indicators tailored to PDTH, thereby enhancing its effectiveness.

4.3 Limitations and Future Directions

This study contributes to the growing body of literature by proposing an integrated, thematic, and frequency-based risk assessment framework that systematically identifies sustainability-related challenges in post-disaster temporary housing (PDTH). By quantifying both the thematic distribution and the prevalence of risk factors in the literature, the study offers a dual-layered prioritization model. This approach enables policymakers, designers, and humanitarian actors to align their strategies with the most frequently encountered and thematically significant sustainability risks in practice.

However, one limitation lies in the scope of the literature sample. The analysis was restricted to peer-reviewed articles indexed exclusively in the Web of Science database. As a result, potentially relevant studies from other reputable sources, such as Scopus or Google Scholar, were not included. This may have limited the diversity of perspectives captured in the dataset. Future studies should aim to expand the bibliographic scope and include a broader range of data sources to ensure more comprehensive coverage.

In addition, while the study provides a literature-driven framework, validating the findings through empirical fieldwork remains an important next step. Future research should incorporate expert-based assessments, post-occupancy evaluations, or real-world case studies to explore how specific risks manifest in different geographic, institutional, or socio-economic contexts. The use of advanced tools, such as GIS-based land suitability analysis, BIM-supported sustainability simulations, or participatory co-design techniques, could also enhance the contextual relevance and applicability of the proposed framework.

Ultimately, addressing sustainability risks in PDTH requires more than isolated technical interventions. It necessitates a fundamental rethinking of how temporary housing is conceptualized—not merely as a stopgap solution, but as a transitional phase with long-term socio-environmental implications. This study underscores the importance of multidimensional, data-informed, and context-sensitive approaches to developing resilient, inclusive, and sustainable post-disaster housing strategies.

5. CONCLUSION

This study examined the sustainability risks linked to post-disaster temporary housing (PDTH) by reviewing peer-reviewed literature published between 2016 and 2025. Using a thematic and frequency-based content analysis, 24 unique risk factors were identified and grouped into four main categories: environmental, economic, social, and operational. Notably, economic risks such as high life-cycle costs, resource constraints, and poor reuse potential were the most frequently noted concerns. Environmental issues, such as carbon intensity and energy inefficiency, also received significant focus. Meanwhile, although social and operational risks are less frequently mentioned, they highlight important gaps related to user dissatisfaction, weak institutional coordination, and insufficient long-term planning.

By combining thematic classification with frequency data, this research provides a structured perspective for prioritizing sustainability risks in PDTH. The proposed framework not only emphasizes the most urgent issues but also highlights areas that might be overlooked in current discussions. This integrative approach encourages moving away from short-term, reactive solutions toward more intentional and multidimensional planning strategies that integrate sustainability at every stage of the temporary housing process.

In practical terms, the findings can support the development of evidence-based assessment tools and planning models that are context-sensitive. For decision-makers, designers, and humanitarian actors, this study provides a data-driven roadmap for navigating the complex landscape of sustainability in disaster recovery.

Future research should build on this foundation by incorporating real-world validation—such as field studies, stakeholder consultations, and post-occupancy evaluations—to assess the practical relevance of the identified risks. Additionally, adopting digital tools like GIS, BIM, and participatory design methods can further enhance the responsiveness and resilience of temporary housing solutions. Ultimately, creating sustainable PDTH systems involves more than technical efficiency; it requires inclusive, informed, and adaptable approaches rooted in both evidence and empathy.

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