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Rethinking the second life of post-disaster and post-conflict temporary housing

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ABSTRACT

Providing temporary housing (TH) units after natural hazards and social conflicts is often an urgent necessity. Beyond their initial configuration, the second life of these units is crucial, given their temporary nature. Despite growing interest in second-life strategies, many TH units and associated infrastructure remain unused or inefficiently managed after their initial deployment. Second-life strategies are presented for post-disaster and post-conflict (PDPC) TH units and settlements in Türkiye, using two case studies—the 2011 Van earthquakes and Syrians under temporary protection—and expert insights from the Disaster and Emergency Management Presidency of Türkiye (*Afet ve Acil Durum Yönetimi Başkanlığı*—AFAD). A three-step methodology was employed, including a literature review, semi-structured expert interviews and hybrid deductive–inductive thematic analysis. Findings reveal that second-life outcomes are largely shaped by policy gaps, operational conditions, tenure constraints, institutional decisions and user practices rather than by design-based circular approaches. The proposed framework provides practical guidance for policymakers and practitioners in Türkiye and other crisis-prone contexts to improve resource efficiency and integrate second-life planning into preparedness and recovery processes.

POLICY RELEVANCE

Policy gaps are a major barrier to implementing second-life strategies for TH and settlements in Türkiye. Strategies are proposed to address them. Housing, land and property rights—the rights to obtain and reside in housing that ensures safety, security and dignity—should form the foundation of any second-life policy, as tenure determines whether entire settlements or only individual units can be repurposed. A national take-back policy with clear guidelines and structured repair and decommissioning processes is essential to maintain unit quality and avoid the redeployment of unusable units. Neighbourhood dynamics and social considerations may also affect the feasibility of

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converting temporary settlements into permanent ones. The long-term concentration of affected populations in a single location may hinder social and psychological recovery. Integrating second-life planning into the preparedness phase can enhance the efficiency and sustainability of sheltering responses, optimise resource allocation, reduce waste, and mitigate environmental impacts.

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1. INTRODUCTION

Since the emergence of semi-permanent settlements, disasters have posed some of the most severe challenges to human societies (Quarantelli 2006). With the rapid expansion of cities, the number of people exposed to crises continues to rise. By the end of 2024, a total of 83.4 million people worldwide were recorded as internally displaced, of whom 73.5 million were displaced by conflict and violence, while 9.8 million were displaced as a result of disasters (IDMC 2025). These numbers account only for internal displacement; when cross-border displacement resulting from disasters and conflicts is included, the total number of displaced persons increases substantially. Consequently, reliance on temporary sheltering as an interim solution until permanent housing can be provided has become increasingly critical. This underscores the importance of effective sheltering responses, particularly temporary housing (TH) units, in the aftermath of disasters and social conflicts.

Building on the three main phases of decision-making for post-disaster temporary accommodation—provision, operational and second-life (Hosseini *et al.* 2020)—current practices reveal a persistent gap: the second-life phase remains frequently overlooked or insufficiently examined, despite its growing recognition in recent studies (Kahvecioğlu & Selçuk 2025). Studies on post-disaster and post-conflict (PDPC) shelter criteria have primarily focused on the provision and operational phases, while giving limited attention to the second life of TH. This gap has contributed to a lack of awareness among authorities regarding their potential for reuse (Seike *et al.* 2018; Jiao *et al.* 2025). As a result, thousands of TH units, along with their infrastructure, remain idle after their initial use, leading to a considerable waste of resources and a negative impact on the environment (Sener & Altun 2009).

Although second life is a global concern, it is particularly pressing in developing countries such as Türkiye, which is highly prone to natural hazards, especially earthquakes. To address shelter needs following seismic events that damage the built environment, Türkiye commonly provides TH units for affected populations. Indeed, due to the excessive provision of TH units after the 1999 Düzce earthquakes, Kahvecioğlu & Selçuk (2025) noted that the concept of reusing post-disaster TH units has gained increasing global attention in the literature. As another recurring seismic event, two major earthquakes struck Van in Türkiye, leading to the provision of thousands of TH units for approximately 175,000 people (AFAD 2014). Beyond earthquakes, Türkiye has also faced mass displacement since 2011 as a result of the conflict in Syria. As of December 2012, approximately 150,000 Syrians under temporary protection were hosted in tent- or container-based transitional housing settlements across Türkiye (UNHCR 2012). Consequently, the second life of thousands of TH units and settlements provided for both earthquake victims and Syrians under temporary protection has become a critical issue to examine.

To address this, the present study proposes second-life strategies for PDPC TH units and settlements in Türkiye, drawing on two case studies—victims of the 2011 Van earthquakes and Syrians under temporary protection—and insights from experts at the Disaster and Emergency Management Presidency of Türkiye (*Afet ve Acil Durum Yönetimi Başkanlığı*—AFAD).

This study makes two key contributions. Different from earlier case-based perspectives that examine the reuse of post-disaster TH (Johnson 2007a, 2007b; Arslan 2007; Arslan & Cosgun 2008), it also frames the second-life phase as a strategic and policy-oriented domain. Within this empirically grounded strategy framework, the study incorporates policy and spatial perspectives on current practices. By distinguishing transferable principles from context-specific conditions, it provides actionable guidance to promote more sustainable and resilient PDPC sheltering responses in Türkiye and other post-disaster or displacement contexts.

The paper is structured as follows. Section 2 reviews the literature on the second life of PDPC TH units and settlements. Section 3 presents the methods. Section 4 presents the sheltering response for two case studies. Section 5 analyses the interviews with experts. Section 6 provides the discussion. Section 7 concludes.

2. BACKGROUND

A phased sheltering strategy is often applied to address the extensive sheltering needs after crises, since it is not feasible to provide permanent housing for all affected individuals simultaneously. Either in four phases—emergency sheltering, temporary sheltering, TH and permanent housing (Quarantelli 1995)—or in three stages: emergency shelters, temporary shelters and permanent housing (Forouzandeh *et al.* 2008), a PDPC sheltering response is commonly applied. The International Federation of Red Cross and Red Crescent Societies (2013) further defines three additional shelter typologies: transitional shelter (T-shelter), progressive shelters and core shelters. After disasters, between the moment of a crisis and the provision of permanent housing, these sheltering approaches are implemented either sequentially or through non-linear sheltering responses, as highlighted by Bashawri *et al.* (2014). In other words, these sheltering types serve to bridge the gap between the immediate aftermath of a crisis and the provision of permanent housing (Johnson *et al.* 2006).

TH is generally defined as accommodation that enables affected populations to resume their daily activities, and is typically intended for use over a period of six months to three years (Quarantelli 1995). In Japan, however, such units are commonly disassembled within two to five years of their provision (Seike *et al.* 2018). While numerous studies have examined the provision and associated criteria of these units by humanitarian organisations (JICA 2002; Sphere Association 2018; UNHCR 2024) or academic scholars (Chen *et al.* 2014; Nappi & Souza 2015; Nath *et al.* 2017; Aburamadan & Trillo 2019, 2020; Asfour 2019; Afkhamiaghda *et al.* 2020; Kuchai *et al.* 2024), only a few have addressed their second life or future use, as well as that of the settlements in which they are located. Section 2.1 addresses studies on the second life of PDPC TH units and settlements.

2.1 SECOND LIFE OF TEMPORARY HOUSING AND SETTLEMENTS

The second life of PDPC TH units and settlements refers to their utilisation beyond their initially intended emergency purpose through various strategies aimed at addressing sustainability, cost management or environmental concerns. Within discussions of this extended lifespan, sustainability emerges as one of the most frequently emphasised criteria in the literature. However, despite its prominence in the literature, the sustainability of PDPC sheltering is conceptualised inconsistently across studies, largely due to the inherently normative nature of the concept (Kwaylih *et al.* 2023).

Sustainability has been examined from multiple perspectives, including economic, social and environmental dimensions (Hosseini *et al.* 2016; Kwaylih *et al.* 2023). Adopting a more differentiated framework for TH units, Pomponi *et al.* (2019) proposed four sustainability dimensions: technical, economic, environmental and social. Addressing the relationship between shelter and sustainability, Kwaylih *et al.* (2023) further expand this perspective by emphasising not only design-related sustainability assessments but also accessibility to services and user behaviour.

Building on this multidimensional approach, the economic dimension has recently been emphasised through the lens of the circular economy, which has been highlighted as a promising crisis–response strategy at the intersection of circular economy and disaster management. In this context, the integration of circular design principles into reconstruction practices was identified as one of the ten key strategies within the proposed Build Back Better framework (Çetin & Kirchherr 2025).

In light of the significance of this strategy, the second-life potential of post-disaster TH units has come to the forefront, as underscored by Johnson (2007b), who framed it as a sustainable practice encompassing economic, environmental and social dimensions. Expanding on this perspective,

Corsellis (2012) conceptualised T-shelters as incremental solutions grounded in five key principles: upgradability, reusability, relocation, resale and recyclability. Building on this framework, the second life of PDPC TH units has been predominantly discussed in the literature through two interrelated concepts: reusability, including recyclability (Johnson 2007a, 2007b; Arslan 2007; Arslan & Cosgun 2008; Corsellis 2012; Seike *et al.* 2018; Jiao *et al.* 2025; Çetin & Kirchherr 2025), and convertibility, referring to the capacity of units to be upgraded or adapted for different functions (Corsellis 2012; Parva & Rahimian 2014).

Building on this perspective, Atmaca (2017) demonstrated that the life-cycle stages—production, construction, operation (use) and demolition (end of life)—outlined in the CEN TC 350 standards (CEN 2008) can be applied to post-disaster TH, including container and prefabricated units. In practice, these stages commonly correspond to the off-site manufacturing of units under time constraints, their on-site assembly in temporary settlements, the operational phase during which affected communities inhabit the units and, finally, either their direct reuse within the settlement or their dismantling due to housing, land and property (HLP) constraints. In line with this framework, the disassembly of units has frequently been highlighted as a critical consideration (Aburamadan & Trillo 2019; Bashawri *et al.* 2014), particularly with regard to their environmental impacts (Sener & Altun 2009; Félix *et al.* 2013; Afkhamiaghda *et al.* 2020; Hosseini *et al.* 2020; Kuchai *et al.* 2024).

Kwaylih *et al.* (2023) presented a comprehensive overview of the field-based research process in shelter analysis, highlighting the central role of sustainable development, particularly between 2013 and 2022. Similarly, recognising the strong relationship between sustainability, second life and environmental impact, Kahvecioğlu & Selçuk (2025) investigated three interrelated concepts—post-disaster, TH and reuse—with the objective of contributing to the discourse on the United Nations' (2015) Sustainable Development Goals (SDGs). Drawing on a comprehensive literature review, they demonstrated a notable rise in scholarly attention to these concepts over the past two decades. This trajectory reflects the growing academic and practical recognition of the reuse of post-disaster TH units as a critical sustainability concern. A turning point was the emergence of reuse as a distinct area of enquiry, particularly in relation to the aftermath of the 1999 Düzce earthquake in Türkiye.

This turning point can be linked to the reuse-oriented studies conducted by Johnson (2007a, 2007b), Arslan (2007) and Arslan & Cosgun (2008). Examining the Turkish case through TH settlements in Düzce, Johnson (2007a) identified five options for the second life of these units: long-term use, dismantling and storage, sale, demolition, and reuse. In a more comprehensive study conducted approximately four years after the provision of TH units for communities affected by the 1999 earthquakes in Türkiye, Johnson (2007b) outlined the following second-life strategies for TH units:

- selling the units entirely or partially
- leaving units to squatters for their own use
- renting the units
- repairing the units for reuse in future emergencies
- refunctioning units as community buildings
- disassembling the units
- maintaining the units as permanent housing.

Following the same earthquakes in Türkiye, Arslan (2007) introduced a process for the recycling and reuse of TH units. Building on this, Arslan & Cosgun (2008) advanced the approach by addressing three main aspects: units, land and infrastructure (Figure 1). In their process, for TH units, decomposing the main building components allows for the recombination of panels as a reuse path, while decomposing the lower building components enables their reuse as raw materials. Regarding the land of TH settlements, either assigning a new function with different buildings or reusing the existing units and infrastructure was suggested. Finally, for infrastructure, either integrating the system into the regional network or removing it altogether was proposed.

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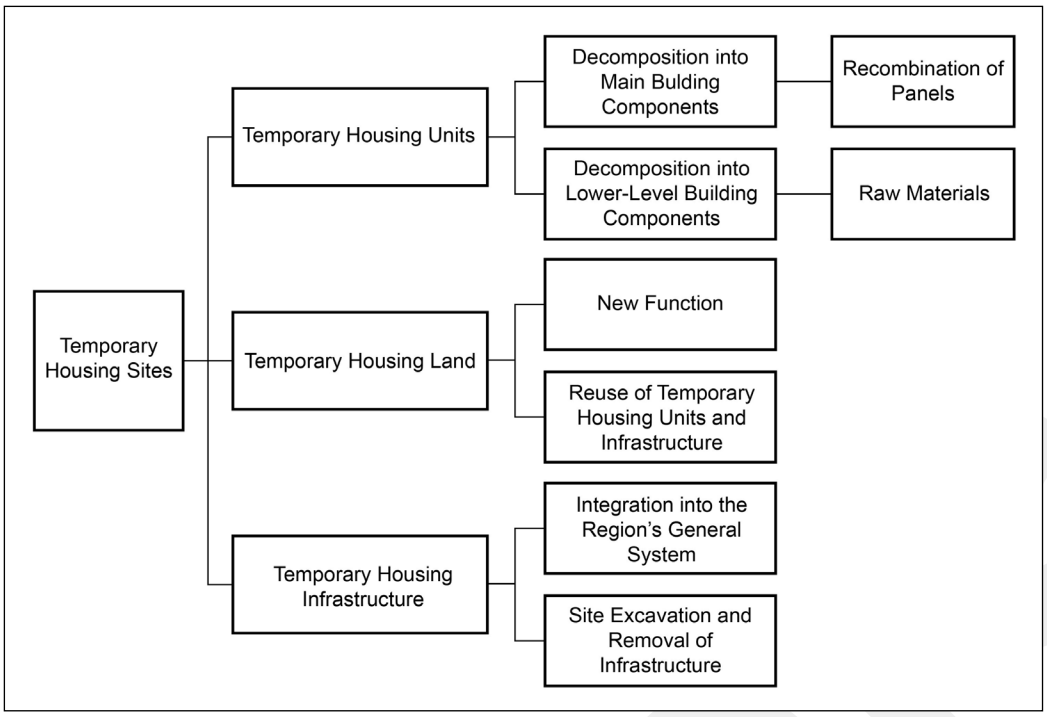

Figure 1: Recycling and reuse process of temporary housing (TH) units.

Sources: Adapted from Arslan (2007) and Arslan & Cosgun (2008).

Beyond Türkiye, the concept of second life has also been addressed within the framework of T-shelters. Corsellis (2012) conceptualised the T-shelter as a solution achieved through five actions: upgrading into permanent housing, repurposing, relocating from a temporary site to a permanent one, reselling to generate income for recovery, and recycling for use in reconstruction processes. This approach was applied following the 2004 Sri Lanka tsunami, the 2004 Yogyakarta (Indonesia) earthquake, the 2010 Haiti earthquake, the 2007 Peru earthquake and the 2004 Aceh (Indonesia) tsunami.

The reuse of TH units has also been examined in Japan. Seike *et al.* (2018) investigated the TH units provided after the 2011 Great East Japan Earthquake, which were disassembled by 2016, and subsequently explored the implementation of an intra-regional reuse policy. Based on site surveys and interviews with local governments, they found that fewer than 0.5% of approximately 50,000 units were reused, largely due to management challenges and a limited awareness of the concept of reusability. They further revealed that each unit comprises multiple components—including the foundation, structure, roof, ceiling, floor, exterior and interior walls, windows, and equipment—whose reusability varies depending on material properties and construction techniques. In light of these findings, two major challenges were identified: changes in floor plans and variations in foundation specifications.

Focusing on second life of temporary wooden houses provided after disasters, Jiao *et al.* (2025) identified the key criteria influencing their reuse through surveys and municipal interviews. The examined factors included prefecture, ownership of construction site, use of construction site, site area, site area per unit, construction method, foundation type and location of step elimination. They distinguished criteria for both local reuse and relocation. For local reuse, six conditions were highlighted: ownership of the construction site, land classification, site area, site area per unit, slopes and steps difference elimination. For relocation, the relevant criteria were ownership of the construction site, land classification, site area, site area per unit, construction method, foundation type, roofing material type and exterior wall finish type. Their findings suggest that while the size of the site area per unit is the determining factor for local reuse, the construction method is most influential for relocation. Importantly, the study also revealed that since Japanese law and regulatory frameworks define these units as temporary, local governments demonstrate limited awareness of their second-life potential, largely due to their lack of involvement in the construction and operation processes.

Besides reusability studies, Parva & Rahimian (2014) examined 189 post-earthquake TH units in Lar, Iran, over four decades, addressing convertibility as a potential strategy for extending their second life. They revealed that 98% of the units were subsequently adapted by users through alterations in five components: layout, typology, materials, openings and ornamental elements.

In addition to methodological studies and studies examining informal inhabitant-led applications of convertibility in the literature, there are also practical applications that consider the long-term use of temporary units during the planning phase of unit design. Since permanent housing constitutes the ultimate goal of post-disaster sheltering, the HHi House, proposed by Humanitarian House International (HHI), and Better Shelter, designed by a Swedish non-profit foundation, exemplify single structural units that can be converted by replacing certain non-structural elements rather than the entire structure (Ohlson & Melich 2014a; Better Shelter n.d.). Specifically, in the HHi system, an emergency shelter can be converted into a long-term dwelling unit within a day by only two people through the modification of facade and roof materials (Ohlson & Melich 2014b). Similarly, the Better Shelter 'all-in-a-box' unit can be upgraded with locally sourced materials to enhance durability and adapt it for extended use, with the aim of being upcycled through reuse, repurposing and recycling (Better Shelter n.d.). Considering these pre-planned unit design examples, incorporating circularity into design requirements and standards is crucial to ensure long-term adaptability, resource efficiency and sustainable second-life strategies, as emphasised by Çetin & Kirchherr (2025). Moreover, the barrier of 'contaminated interaction'—commonly identified in the circular economy literature as an obstacle to reusing perfectly functional units (Baxter *et al.* 2017)—can be addressed through a convertibility approach.

Despite the increasing number of studies on the second life of PDPC TH units—covering reuse practices, sustainability dimensions and component-level performance—key gaps remain. In particular, few studies address governance mechanisms, including HLP considerations, take-back policies and long-term management, which are crucial for ensuring that units and infrastructure can be sustainably reused, repurposed or decommissioned, while also accounting for social and neighbourhood dynamics.

3. METHODS

Section 2 reviewed the second-life strategies, methodological studies and practices related to PDPC TH settlements together with the key gaps identified as the limited attention to governance mechanisms, institutional decision-making processes and long-term management frameworks in the literature. To address these gaps, this study conceptualises the second-life phase not merely as a post-occupancy outcome, but as a strategic and policy-oriented domain.

The research adopted a qualitative design to develop an empirically grounded, strategic framework for second-life planning in Türkiye. The study focuses on how institutional actors conceptualise, manage and operationalise second-life processes rather than solely documenting reuse cases. Empirically, the research draws on two major sheltering contexts—the 2011 Van earthquakes and the response for Syrians under temporary protection in Türkiye—along with expert interviews conducted with AFAD.

A three-step methodology was employed:

- a literature review identifying conceptual and applied approaches together with key gaps
- semi-structured interviews with AFAD experts exploring Türkiye's second-life strategies, including topics such as current practices, convertibility potential and potential second life uses
- a hybrid deductive–inductive thematic analysis.

3.1 SAMPLE GROUP AND DATA COLLECTION

Since 2009, AFAD has served as the coordinating institution for crisis and disaster management in Türkiye, including sheltering responses. To address urgent sheltering needs, AFAD acts as the

primary coordinator, working in collaboration with supporting partners within the Disaster Shelter Group, as outlined in the Türkiye Disaster Response Plan (*Türkiye Afet Müdahale Planı*—TAMP) (AFAD 2022).

Given its central role under TAMP, the AFAD was responsible for managing sheltering operations following the Van earthquakes and for Syrians under temporary protection in Türkiye. Considering this, a purposive sampling strategy was employed to capture policy-level and operational expertise on PDPC sheltering and second-life processes.

Inclusion criteria were:

- direct involvement in PDPC shelter planning, implementation, logistics or settlement management
- institutional knowledge of sheltering response and PDPC TH units.

Although this was not defined as a formal inclusion criterion, nearly all participants had the opportunity to observe PDPC settlements *in situ* during various events in Türkiye and abroad. Consequently, the semi-structured interviews capture not only their professional expertise in sheltering responses but also their first-hand experiences and observations of these settlements.

Experts (n = 13) participated in the study, ranging in age from 30 to 60 years, with a relatively balanced gender distribution. The sample included technical specialists and mid-level administrators from relevant departments. Participants represented multidisciplinary backgrounds, including engineering, architecture, urban planning, statistics, public administration, social services and construction technology. This multidisciplinary composition offers a broad range of expertise and perspectives, enriching the study with comprehensive insights and varied viewpoints.

Interviews were conducted in person, in Turkish and audio-recorded with participants' informed consent, except for one participant. The recordings were transcribed verbatim and, where necessary, translated into English by the research team. Data collection continued until no substantially new themes emerged from the interviews, providing a reasonable overview of the main patterns and perspectives relevant to the second life of PDPC TH units. However, it is acknowledged that each crisis context may generate different experiences and insights.

3.2 ANALYSIS OF THE INTERVIEWS

The data collected from the semi-structured interviews were analysed using a hybrid deductive–inductive thematic analysis (Fereday & Muir-Cochrane 2006; Gibbs 2007). Deductive codes were informed by second-life concepts identified in the literature review, while inductive codes emerged from the participants' narratives.

Following the principles of this approach and the study's objectives, theme development for data analysis proceeded in four stages (Vaismoradi *et al.* 2016):

- Initialisation: systematic coding of transcripts.
- Construction: classification and refinement of codes.
- Rectification: hierarchical organisation into candidate themes.
- Finalisation: iterative review and interpretation.

4. SHELTERING RESPONSE FOR TWO CASES

Due to the differing causes of the crises, two distinct sheltering response pathways were implemented: one for the victims of the 2011 Van earthquakes and another for Syrians under temporary protection. Considering their differing conditions—such as usage period, scale and population size—these cases were selected for discussion with AFAD experts, as they can provide contrasting insights into the second life of PDPC TH units and settlements.

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4.1 SHELTERING RESPONSE AFTER THE VAN EARTHQUAKES

In October 2011, a 7.1-magnitude earthquake struck Erciş, Van, a densely populated area in eastern Türkiye. Approximately two weeks later, in November 2011, another earthquake with a magnitude of 5.6 occurred in Edremit, within the same region (USGS 2017). The destruction of the built environment was severe: 644 people lost their lives, while 36,203 residential buildings, 2884 office buildings and 9602 barns were reported as being heavily damaged or collapsed (AFAD 2014), creating a widespread need for shelter.

In addition to people who temporarily relocated to public buildings outside Van, the AFAD established 13 tent settlements accommodating approximately 25,000 people (AFAD 2014). After 3.5–4 months, these tent cities were closed and their residents were transferred to 35 planned container settlements comprising about 30,000 units and hosting nearly 175,000 people. Within the first year after the earthquake, the Housing Development Administration of the Republic of Türkiye (*Toplu Konut İdaresi* Başkanlığı—TOKİ) completed approximately 15,000 permanent houses (AFAD 2014).

As a result, approximately 175,000 people relied on TH units for eight months until permanent housing became available, raising important questions about the second life of these units, as their use extended significantly within their intended lifespan.

4.2 SHELTERING RESPONSE IN TÜRKIYE FOR THE SYRIAN CONFLICT

Following the onset of the Syrian conflict in 2011, approximately 5.6 million Syrians were displaced. Türkiye, as a neighbouring country, became one of the main hosts, accommodating the majority of displaced Syrians. Temporary protection for Syrians in Türkiye began in October 2014. Data from June 2022 indicate that nearly 3.7 million Syrians—about 65% of the displaced population—were living in Türkiye after almost a decade, while May 2025 data show that roughly 2.7 million remained after nearly 15 years (Refugees Association 2022, 2025).

After the initial crossings in April 2011, around 150,000 Syrians lived in emergency and temporary settlements by December 2012, with the majority residing in urban and rural housing (UNHCR 2012). By early 2013, 17 settlements accommodating approximately 184,000 people had been established (UNHCR 2013), increasing to 21 settlements hosting 228,000 Syrians across 10 provinces by 2017 (AFAD 2017). In 2018, 30.6% of residents in settlements still lived in tents or partitioned areas, while 69.4% were in container units (AFAD 2018). Between 2018 and 2020, 12 settlements were closed, four were decongested and the management of the remaining sites was transferred to the Directorate General of Migration Management (*Göç İdaresi Genel Müdürlüğü*—DGMM) (3RP 2020; Refugees Association 2021). As of July 2022, approximately 49,000 Syrians continued to reside in settlements (Refugees Association 2022).

Given the long-term use of these units and the extensive infrastructure provided, planning for their second life has become increasingly important.

5. ANALYSIS OF SEMI-STRUCTURED INTERVIEWS

The interviews addressed the current situation, the concept of convertibility and potential second-life uses of PDPC TH settlements examined in relation to both conceptual and applied approaches. Although perceptions varied depending on the respondents' departmental backgrounds, there was broad consensus that the sheltering response—together with the food supply—constitutes one of the two most critical tasks that must be effectively organised following disasters and emergencies. Within this context, the second life of PDPC TH settlements emerged as a key subtopic of sheltering response that requires systematic planning and organisation.

Participants emphasised that the reusability or reconfigurability—namely, the potential second life—of temporary settlements is crucial to prevent abandonment and the emergence of uncontrolled or unintended uses. According to the respondents, unused sites may become difficult to manage and monitor over time. Accordingly, a well-planned second life was considered essential to ensure appropriate and safe placemaking.

5.1 CURRENT SITUATION IN THE SECOND LIFE OF TEMPORARY HOUSING

When evaluating the current situation regarding the second life of PDPC TH settlements and units, experts generally conceptualised the issue in two parts: infrastructure and superstructure. While infrastructure was identified as reusable depending on land ownership, the superstructure was categorised as either waste or reusable, largely depending on the length of time it had been inhabited.

With respect to infrastructure, the ownership status of the land—closely linked to HLP considerations—was frequently emphasised. Settlements constructed on government-owned land were considered relatively flexible to be reconfigured. By contrast, infrastructure built on privately owned land rented by the government was regarded as non-transferable, since legal agreements typically required the government to return the land in its original condition. In practice, this means that infrastructure had to be dismantled and the land restored to its pre-settlement state.

Discussions on the second life of the superstructure were frequently linked to challenges related to take-back policies and lifespan with participants emphasising that prolonged storage may reduce the usability of these units.

Considering take-back policies in Türkiye, experts emphasised that one of the most persistent challenges following disasters triggered by natural hazards is the retrieval of distributed housing units. Respondents reported difficulties in reclaiming the units once they had been distributed. One respondent described the problem of collection alongside distribution as follows:

> We hear that tents are being sold; we even find tents buried underground. [...] A more controlled process could be achieved.
>
> (P2)

The lifespan of the superstructure was identified as another barrier to considering the second life of PDPC TH units, closely linked to the characteristics of each crisis. For example, since Syrians in Türkiye have been accommodated in TH settlements for more than a decade, several experts described these superstructures as waste after long-term use. By contrast, the units supplied to the affected groups of the 2011 Van earthquakes were considered reusable, as their period of use was limited to approximately a year and they could be redeployed for similar functions in subsequent disasters. However, alternative uses adopted by affected groups were also highlighted as a barrier to extending their lifespan. One expert noted that citizens were reluctant to return the units because they had repurposed them for other uses, such as barns for animals. While such practices may be interpreted as a form of user-driven or informal second life, they reduce the number of units available for institutional reuse, thereby limiting their operational lifespan within the formal sheltering system.

Another respondent illustrated the issue with an example:

> Containers used following the 2011 Van earthquakes were later sent to another city after an earthquake. However, people chose to live in tents instead of containers. The containers stood empty along the roads. Since people in Van had used them for their animals, no one wanted to live in them. No recycling—can they be reused? They are not being used; they just remain there.
>
> (P6)

These examples underline that the second life of TH may take different forms depending on who assumes control over the units. User practices frequently influence second-life outcomes, and, in this context, institutional planning may be affected or reshaped by informal or user-driven uses.

Additionally, usage practices were identified as another factor influencing lifespan. An expert who had visited settlements for both Syrians under temporary protection and victims of the 2011 Van earthquakes highlighted that different user practices and maintenance habits may affect the durability of units over time. Another expert noted:

> We used most of the containers supplied after the Van earthquakes for the affected group during the Syrian crisis. However, it is controversial whether we can reuse the ones allocated for the Syrian crisis in another earthquake [...] washing their containers [...] this damages the material, making it unsuitable for reuse.
>
> (P8)

In light of these challenges, experts also emphasised the importance of repair and elimination of units as part of second-life considerations. Incorporating these two processes into the existing framework can improve efficiency by preventing the transport of irreparable units to new crisis sites, which could otherwise lead to the creation of abandoned settlements.

5.2 THE CONCEPT OF CONVERTIBILITY

All respondents considered the concept of convertibility effective for promoting sustainability; however, land ownership and neighbourhood dynamics were identified as significant obstacles to its implementation as a second-life strategy. Similarly, regarding the second life of infrastructure, land ownership was repeatedly noted as a limiting factor for convertibility unless the land is government-owned.

Another critical theme related to convertibility was neighbourliness. Evaluating the concept for Turkish citizens, one expert explained:

> Neighborliness is very important for us. We have a habit of choosing our own neighborhood rather than following state assignments, and people are generally more satisfied this way. I don't know how our society would respond otherwise. I don't think this approach would be applicable for Turkish citizens—they would prefer to live in their familiar neighborhoods again.
>
> (P4)

Similarly, another respondent highlighted this issue:

> If you are going to be permanent in a place where you were initially temporarily settled, the location must at least be well-determined from the beginning. [...] I am going to be a neighbor with the people in the next tent for the rest of my life. This would be much more cost-effective, but it could also create other problems. As I said, I currently perceive this place as temporary. Two years from now, I do not see myself here, yet I am told that I will live here for my entire life. Therefore, site planning should be carried out with this in mind.
>
> (P2)

Another critical obstacle to convertibility, linked to neighbourhood dynamics, was the practice of grouping only individuals who had experienced a disaster into a single settlement, without considering their psychological wellbeing. One respondent noted:

> When you gather all the disaster victims in a settlement, you force those people to relive the impact of the disaster throughout their lives.
>
> (P8)

In light of these challenges, pre-planning emerges as a crucial strategy for convertibility, enabling the accommodation of individuals from the emergency phase through the subsequent stages of resettlement.

5.3 POTENTIAL SECOND LIFE

Although the second life of PDPC TH units and settlements has been a topic of discussion, it is often underestimated in practice. Experts were therefore asked about the potential second life of PDPC settlements and units provided to victims of the 2011 Van earthquakes and to Syrians under

temporary protection. When evaluating the second life of current settlements, as well as those already closed or decongested, experts frequently emphasised urgent national needs, in addition to reuse, for the same or different functions.

Rather than directly comparing the two cases, most experts addressed the second life of units without relating to the specific user group or context. One expert, who worked in the Commission for the Evaluation of Containers (an internal commission within the AFAD) following the 2011 Van earthquakes, highlighted the strategic location of current Syrian settlements:

> We have a container city in Maraş. Maraş could face an earthquake with a magnitude of 7. Following a similar approach to what we applied in Van—accommodating people in different cities—if an earthquake occurs in Erzurum, Erzincan, or Bingöl, we can transport these people to settlements in Maraş.
>
> (P5)

Another expert noted that needs vary according to hazard-prone areas:

> The need in the Black Sea region is higher due to the risk of landslides and rockfalls. Therefore, containers are considered for transfer to the provinces where they are most needed.
>
> (P1)

Moreover, several experts suggested that these units could be used to provide homes for Syrian people in their home country once settlements in Türkiye are fully closed.

Considering urgent national needs, respondents proposed several potential reuse approaches, including dormitories, homes for orphans, retirement homes, educational facilities and observation points for police.

6. DISCUSSION

The purpose of this study was to propose second-life strategies for PDPC TH units and settlements in Türkiye by incorporating the perspectives of experts from the national disaster management authority. In doing so, the study underlines the potential for developing more sustainable second-life pathways that optimise resource allocation, reduce waste and mitigate environmental impacts.

Table 1 summarises the second-life strategy framework derived from the hybrid deductive–inductive analysis, presenting the identified strategy domains, their associated themes and their alignment with the existing literature.

Table 1: Second-life strategies for post-disaster and post-conflict (PDPC) temporary housing (TH).

SECOND-LIFE STRATEGY	THEMES	TYPE
Operational reuse	Reuse and redistribution for future crises	Deductive
	Duration-based waste perception	Inductive
	Material deterioration due to prolonged use and storage	Inductive
Resource recovery/take-back	Take-back challenges	Inductive
	User practices affecting unit lifespan	Inductive
	Social acceptance of reused units	Inductive
Governance and land management	Housing, land and property (HLP) and land ownership constraints	Deductive
	Infrastructure–superstructure distinction	Inductive
Convertibility strategy	Convertibility to durable solutions	Deductive
	Context dependency	Inductive

Overall, the findings suggest that, in practice, the second life of PDPC TH in Türkiye operates primarily as an operational and condition-driven process rather than as a strategically planned circular system. While the literature often frames second life in terms of design adaptability, circularity and long-term planning, the interview results indicate that decisions are largely shaped by immediate operational needs, unit condition, land ownership and crisis-specific demands. This points to a gap between conceptual second-life frameworks and their implementation in practice.

The interview results confirmed findings similar to those highlighted by Seike *et al.* (2018) in the Japanese context: TH units are generally considered temporary and are dismantled after use, once land-use agreements require the land to be restored to its pre-settlement state.

First, in contrast to Arslan & Cosgun's (2008) threefold categorisation of second life—reuse of land, reuse of infrastructure and reuse of units—AFAD experts emphasised a twofold perspective: infrastructure and superstructure. This distinction reflects a practice-oriented approach to second-life management and suggests that decisions are governed not only by the condition of individual units but also, and often primarily, by land availability and infrastructure conditions.

Second, the findings stress that HLP, as underlined by UNHCR (2024), should serve as the starting point for policymakers aiming to establish a systematic second-life framework. Land ownership determines whether entire settlements can be retained, reconfigured or dismantled, thereby shaping whether second life occurs at the settlement scale or only at the level of individual units, consistent with the T-shelter approach described by Corsellis (2012).

Third, the variability in unit usage periods highlights the necessity of a structured take-back policy. Such a policy would provide a formal mechanism for managing second-life practices, clarifying whether units should be redeployed for urgent needs or decommissioned. It should also include guidance on appropriate use during occupancy, as user-driven adaptations—while sometimes representing informal second-life practices—may reduce material quality and limit future reuse.

Fourth, because PDPC TH units and settlements frequently remain in use longer than originally planned—not only in Türkiye but also across post-crisis contexts—a structured repair, assessment and decommissioning phase becomes essential. Institutional mechanisms, such as the AFAD's Commission for the Evaluation of Containers, play a critical role in ensuring that unusable units are not redeployed or redistributed, thereby preventing both resource inefficiencies and the emergence of abandoned or underutilised settlements.

In addition, although this study presents an institutional perspective on second life, the findings indicate that outcomes are not determined solely by institutional planning. User practices, local conditions, and land agreements frequently reshape the trajectory of units and settlements. In this sense, second life emerges as a multi-actor process shaped through the interaction between institutional frameworks and everyday use practices, rather than a fully centralised operational outcome.

Finally, AFAD experts highlighted neighbourhood dynamics as an important consideration for convertibility. While the collective relocation of affected populations is a common practice in permanent housing provision in Türkiye, concerns were raised that temporary settlements—originally planned for short-term use—may not provide the spatial, social and environmental conditions required for long-term living. If such settlements are converted without comprehensive planning, prolonged residence in environments perceived as temporary may negatively affect social and psychological recovery. These findings suggest that conversion into permanent use should be approached cautiously and supported by early-stage planning and careful site selection, as also emphasised by Çetin & Kirchherr (2025).

Considering all, the findings indicate that second life in post-crisis contexts should be understood as a technical or design challenge as well as a governance- and context-dependent process shaped by institutional constraints, spatial conditions and user practices.

This study is subject to several limitations, primarily concerning the composition of the sample. First, while semi-structured interviews were conducted with AFAD experts as the primary authority responsible for organising sheltering responses following crises, the management of settlements

for Syrians in Türkiye was later transferred to the DGMM under the Ministry of Interior. Future research would therefore benefit from incorporating perspectives from the DGMM to ensure broader institutional coverage.

Second, the interviews represent only the viewpoints of AFAD experts, which may have influenced their responses and introduced an institutional bias into the narratives. The researchers maintained reflexive awareness throughout data collection and analysis to mitigate these effects. The views expressed by the participants reflect their professional perspectives and do not necessarily represent the official position of the institution with which they are affiliated. A more comprehensive understanding could be achieved by including a wider range of stakeholders, such as host-community residents, individuals with lived experience of crises, displaced populations, non-governmental organisations (NGOs) and other humanitarian actors. Incorporating these perspectives would provide deeper insights into both the challenges and the opportunities of second-life strategies for TH.

7. CONCLUSIONS

This study explored the strategies, methodological approaches and practices concerning the second life of post-disaster and post-conflict (PDPC) temporary housing (TH) settlements and units. Key gaps were identified, particularly the limited attention given to governance decision-making strategies and long-term management frameworks. The study shows that the second life of post-crisis TH operates not as a design-driven circular strategy but as a governance- and context-dependent process shaped by land conditions, institutional arrangements and user practices.

The contribution of this study lies in presenting second-life strategies—operational reuse, resource recovery/take-back, governance and land management, and convertibility—for PDPC TH. Second-life outcomes are found to be commonly determined by operational needs, unit conditions, land ownership arrangements and the potential for convertibility in response to crisis-specific demands rather than by pre-planned design approaches.

The findings highlight the need to integrate second-life planning into the preparedness phase and to develop context-specific policies that reflect socio-cultural conditions and institutional capacities. In particular, considering HLP factors, institutional strategies and potential user-driven practices can enable institutions to better direct their planning and determine whether second life occurs at the settlement scale or at the level of individual units. The study also emphasises the importance of establishing national take-back policies, clear repair, assessment, decommissioning procedures, and planning approaches that account for neighbourhood dynamics and social recovery processes.

Overall, the proposed framework provides practical guidance for policymakers and practitioners in Türkiye and other crisis-prone contexts seeking to improve resource efficiency, reduce waste, and enhance the resilience and sustainability of post-crisis sheltering.

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COMPETING INTERESTS

The authors have no competing interests to declare.

DATA ACCESSIBILITY

All data generated or analysed during this study are available from the corresponding author upon reasonable request.

ETHICAL APPROVAL

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