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The Role of Local Building Systems in Enhancing the Sustainability of Post-Disaster Temporary Housing

Ahmed Radhi Waheed[1*] Khalid Abdul Wahhab [2]
1. Department of Architecture, College of Engineering, Al-Nahrain University, Al-Jadria St., Baghdad, Iraq
2. Asst. Prof. Dr, Department of Architecture, College of Engineering, Al-Nahrain University, Al-Jadria St., Baghdad, Iraq

Abstract
Housing destruction and resulting population displacement are among the most visible effects of post-disaster scenarios, and the provision of temporary housing during the disaster recovery phase is critical to ensuring adequate levels of comfort, protection, privacy, and a gradual return to normal life activities. The urgent need to provide temporary housing quickly led to a focus on the use of prefabricated building systems based on standardized and comprehensive solutions, and despite the multitude of solutions offered in previous disaster scenarios, they often led to unsuccessful results. Since the solutions offered did not meet users' social and cultural needs, they were unsustainable in the long and short term of the disaster recovery period. Conversely, solutions based on local building systems can significantly reduce costs and provide temporary housing units faster. The research aims to understand the role of the local building system in building and providing temporary housing after disasters and its impact on the sustainable performance of temporary housing during the disaster recovery phase. The research found that a balanced use of prefabricated and local building systems is the best option to make temporary housing more successful after disasters.
Keywords: post-disaster, sustainability, temporary housing, local building systems, prefabricated building systems
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1. Introduction

The number of disasters has increased dramatically over the past decades, with extensive damage to many buildings and the destruction of many homes and infrastructure, causing population displacement. It is essential to start reconstruction work as soon as possible to restore the natural balance of the affected communities.

Post-disaster housing is one of the most prominent issues in the reconstruction process, as providing adequate housing is one of the basic requirements for living with an acceptable level of comfort. People affected by a disaster need temporary housing to help them get back on their feet during disaster recovery. During the disaster recovery phase, the providing housing needs by temporary housing units, homes for relatives, or rented housing, and this process must be rapid because housing loss is more than physical deprivation. Where home destruction leads to a loss of identity and privacy, the provision of temporary housing units is essential to establish a sense of normalcy in the life of the affected community (Barakat, 2003). Therefore, these units must provide privacy, protection, comfort, and improved health conditions for the displaced, essential requirements for starting a post-disaster recovery and reconstruction program.

Given the number of affected populations and the severity of disasters, the humanitarian post-disaster shelter and housing sector has not received sufficient attention, and the importance of the disaster response process is often underestimated. Although there are a variety of temporary housing solutions available after a disaster, these solutions usually do not work well due to misinformation about how people live in post-disaster situations, unfamiliarity with local realities, neglect of local resources, or technology-oriented at the expense of a people-oriented approach. Thus, the designs presented were culturally and locally inappropriate, and, consequently, the implemented solutions were socially, economically, and environmentally unsustainable (Dikmen, Elias-Ozkan and Davidson, 2012), and unsustainable solutions can have negative impacts on the environment and resource depletion. Moreover, it also increases the cost of materials and labor, which reduces the quality of life. However, Potangaroa (2015) found that sustainable temporary housing avoids previous problems and has positive long-term effects. Thus, it is essential to build temporary housing quickly, as sustainability is integral to the design, implementation, and decision-making (Potangaroa, 2015).

The study hypothesizes that choosing materials and building systems is critical to driving sustainable performance when designing temporary housing after disasters.

The study aims to clarify the role of local building systems in enhancing the sustainable performance of temporary housing and how to overcome common problems related to this process. It also aims to present strategies that support this system, such as local resources and community participation, and demonstrate its role in finding long-term and short-term housing solutions.

The research method is analytical and descriptive of the concepts related to temporary housing after disasters,

ways to provide it, and the problems that led to its unsustainability and cultural appropriateness for its users after disasters.

2. Methods of Providing Post-Disaster Temporary Housing

The temporary housing phase is necessary to address the housing problem between the emergency phase and the permanent housing phase after the disaster, and this phase is essential because the displaced need residential areas that meet their basic needs for living and the resumption of daily activities that are not available during the emergency phase.

During this phase, we can call every housing option used by IDPs temporary housing, for example, winter tents, one-room dwellings, rental housing, or temporary housing in camps (Davidson, Lizarralde and Johnson, 2008), and several people are involved in the process:

These people are:

- Disaster relief organizations
- Local governments
- Civic organizations
- private sector
- Professionals and researchers.
- The media

Dikmen, Elias-Ozkan and Davidson (2012) show that there are two ways to organize the housing provision process after a disaster, one from top to bottom (descending) and the other from bottom to top (ascending), as shown in Figure 1.

The top-down management method is the traditional method of providing temporary housing, in which one or two stakeholders are responsible for providing the displaced with the necessary temporary housing. This method is the most popular because it allows standard solutions and implementation in a short time and involves importing housing from different countries. The top-down approach is more technology-oriented, so criticize for its cultural and contextual inappropriateness.

On the other hand, the bottom-up method depends mainly on the community, where the beneficiaries participate in the decision-making, construction, and implementation process thanks to one or more stakeholders. This method is more responsive to the cultural and economic factors of the displaced than the top-down method, where the bottom-up approach helps to enable the displaced to be an independent, self-sufficient community and allows the population to find jobs; this method is best adapted to the local culture, skills, and climate(Dikmen, Elias-Ozkan and Davidson, 2012).

There should be a deliberate debate about which of the two (descending or ascending) methods to use; displaced people also need to be a part of this discussion according to their needs, abilities, and circumstances after a disaster.

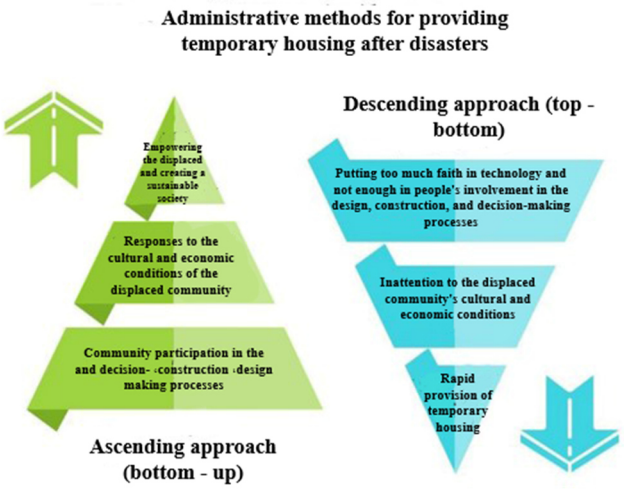

Figure 1. Bottom-up and top-down approaches to providing temporary housing after disasters. Source: (The researchers)

3. The Need for Sustainability in Post-Disaster Temporary Housing

The United Nations High Commissioner for Refugees notes that about 35.8 million refugees cannot access safe, dignified, and sustainable shelter options, and accordingly, after a disaster, there is an urgent need to design safe and sustainable housing that is environmentally friendly, inexpensive, and strong enough to withstand harsh

environmental conditions (Alhabbal, 2019). In this context, Kreuzer (2010) shows that sustainable design and planning for IDP camps are critical (Kreuzer, 2010). It is essential to think about sustainable development when planning for post-disaster housing because many temporary housing complexes will last longer than the emergency period. The sustainability of temporary housing after a disaster is a complex issue with its social, environmental, and economic aspects (Hosseini, 2016)because planning for temporary housing during the emergency phase of a disaster and during this phase the need for housing increases, and the pressure of IDPs on the authority increases, significantly negatively affecting decision-making processes, so disaster recovery fails. Decision-makers do not consider the congruence between the short- and long-term requirements for the characteristics and types of selected temporary housing, so it is necessary to consider a wide range of factors that stem from quick housing systems and other responsible authorities (Davidson, Lizarralde and Johnson, 2008).

Temporary housing after disasters is a vital component of the displaced person's short-and long-term well-being. Therefore, we must consider aspects of sustainability during this stage because neglecting them causes severe practical consequences for both the inhabitants and the surrounding environment and, ultimately, additional costs. As a result, it is imperative to move quickly to a place where sustainability is essential in the procurement, design, and decision-making processes.

3.1 Sustainability Problems Associated with Post-Disaster Temporary Housing

Many solutions and strategies for temporary housing have been developed and implemented over the past decades, but many problems persist, making it difficult to achieve more effective and successful solutions and results. Therefore, this paragraph deals with the difficulties associated with temporary housing from the social, environmental, and economic aspects to provide a knowledge base to find the basis for more sustainable solutions.

3.1.1 Social Problems

These problems include:

1. Problems of adaptability and cultural acceptance of IDPs for the type of temporary housing because of the urgent need to take quick action under the dangerous circumstances of the disaster.
2. Weak community participation in construction and decision-making processes affects society's cohesion and leads to significant losses in historical values and cultural identity and adverse effects on the comprehensive reconstruction process (Gulahane and Gokhale, 2010). For example, Oxfam provided temporary housing (snow huts) after the 1976 earthquake in Turkey, as shown in Figure 2. Oxfam used ex-pats and imported materials to build the houses, but the government and the people living in them did not like them because they were unfit for their culture and climate (Humanity, 2006).

Figure 2. Temporary housing (snow huts) in Turkey. Source: (Humanity, 2006)

3. The site factor has a significant impact on social aspects. Choosing an environmentally and economically poor site may be a reason for failure and the emergence of social problems, which forces the displaced community to reject and leave it. It will be a tremendous waste of resources with an increase in cost. Remote sites cause social exclusion of people affected because they have become a marginalized group, which affects the psychological recovery of the displaced groups and threatens their stability and protection (Félix *et al.*, 2015).

3.1.2 Environmental Problems

These problems include:

1. The vast amount of resources and materials used to build temporary housing units and the lack of solutions for them after they are used (Félix *et al.*, 2015).
6 Environmental pollution caused by the removal and evacuation of temporary housing units and the resulting waste and debris necessitates significant effort to treat.

3.1.3 Economic Problems

These problems include:

1. Excessive investment in the construction of temporary housing units will negatively affect the progress of the reconstruction process and cause a tremendous waste of resources and building materials since they remain in good condition after temporary use (Johnson, Lizarralde and Davidson, 2006).
2. The high cost of temporary housing can sometimes be the same as the cost of permanent homes or more and have a shorter life than them, as the imported materials and the process of moving units have high prices, in addition to the costs of infrastructure for the site of the units (roads, electricity, water) (Fallahi, 2007).
3. People do not think about using temporary housing after a disaster or using it again, leading to arbitrary decisions that cost a lot of money in resources and raw materials for construction(Félix *et al.*, 2015).

4. Types of Building Systems Used in Temporary Housing

The issue of providing temporary housing after disasters has inspired a lot of engineers and architects since the early years of the twentieth century. The urgent need for reconstruction has attracted creators and manufacturers to the field. Still, most of the initial solutions were experimental without real impact in this field (Kreimer, 1979), so many building systems used to construct temporary housing after disasters have primarily made it challenging to find the exact classification that separates each system from others. Among the things that helped the diversity of building systems were:

- A plethora of modern industrial materials with limitless structural and functional capabilities and ongoing development.
- Designing, manufacturing, or building with almost entirely modern technological methods.
- Recently, the rapid technological development of building materials has increased efficiency and lowered costs.

The most crucial endeavor of building systems has been to achieve the most outstanding construction efficiency with the lowest possible use of materials and at the lowest cost of labor and construction time (Bajgiran, 2018); this is accomplished either by having them manufactured, shipped to the intended site, or built on-site by displaced residents or local workers using available materials. Depending on the width, this will divide building systems into two groups:

a. Prefabricated building systems.
b. Local building systems using the materials available on the site.

4.1 Prefabricated Building Systems

During the last century, the industrial sector saw the demand for post-disaster housing as an opportunity to develop new products and technologies, so prefabrication, innovative materials, and advanced technologies played an essential role in the solutions offered in previous disasters scenarios.

The goal of manufacturers after the Industrial Revolution was to bring new items and products to market to increase profits and to develop prefabricated dwellings with walls, ceilings, windows, and doors; for example, Le Corbusier was one of the architects who created new ways of temporary housing by simplifying prefabricated dwellings with walls, ceilings, windows, and doors mobile. At the same time, Walter Gropius pioneered many technologies involving prefabricated walls and partitions; Buckminster Fuller was one of the most influential architects. They pioneered many innovations in prefabrication, particularly in mobile architecture and humanitarian and humanitarian work such as emergency shelters and temporary housing.

In (1929), he designed (with Fuller) the Dymaxion House (Fig. 3), with the concept of "more with less". The house consists of parts made in factories put together on site. Fuller wanted to make temporary housing so that temporary accommodation would be in any environment and use resources efficiently, with easy transportation and assembly (Bajgiran, 2018).

Figure 3. Design a transportable housing unit by
the architect Fuller (1942). Source: (Wagemann, 2012).

Of course, prefabricated building systems can manufacture various parts with other materials and then assemble on-site or delivered as a prefabricated integrated housing unit to the site, so prefabricated systems divide into closed and open building systems.

4.1.1 Prefabricated Building Systems (Enclosed)

The term "Prefabricated Building Systems (Enclosed)" refers to the prefabrication of temporary houses within complete, non-adjustable configurations and shapes. The manufacturing of modular units takes place in offsite factories, then shipping the modular units to any area, including disaster areas, then distributing the modular units on-site as quickly as possible (Hany Abulnour, 2014). Closed building systems in disaster shelter operations are often portable integrated units. Sometimes, they combine the conveyor wheels with the housing unit. The option of compact mobile units can save money concerning construction time but can also cost a lot to transport (Wagemann, 2012), as shown in Figures 4 and 5.

Figure 4. Trailer for temporary housing after Hurricane Katrina, USA. Source:
(https://www.nytimes.com/2007/11/29/us/29trailer.html).

Figure 5. (Left) Full container assembly in factories after 2011
Japan earthquake and tsunami. (Middle) Container deployment at sites (Right)
The container is interior. Source: (Hany Abulnour, 2014).

Portable and moveable housing units can use different technologies, such as deployable technologies and technologies that can expand or contract due to their engineering, physical, and mechanical properties, where they can change their shape and size, such as rigid scissor mechanical structures, tensile structures, or pneumatic structures(Wagemann, 2012).

4.1.2 Prefabricated Building Systems (Open)

The term "prefab (open) building systems" refers to the prefabrication of temporary housing in prefabricated elements and parts, not the structures of prefabricated integrated units. These parts and components are

manufactured in factories and then shipped to disaster areas or repaired areas. Thanks to the residents and other stakeholders, it can modify and install there (Hany Abulnour, 2014).

These units are often foldable or pallet stackable that can be compactly packed and moved into transport containers and then installed on-site or moved and stored in small storage space and used when needed. (Fig. 6) shows an example of a temporary housing system produced by a Swedish company (IKEA) that can build in 4 hours with a foldable design (Sagiroglu and Memari, 2018).

Figure 6: Shelter (IKEA) with a foldable system. Source: (Sagiroglu and Memari, 2018)

4.2 local building systems

After a disaster, both displaced and non-displaced communities seek urgent shelter. Usually, they do not wait for official assistance (ready-made solutions) because it often comes too late. Hence, communities tend towards self-relief based on spontaneous solutions through local and traditional building systems using materials available in the location. The selection of the appropriate construction materials is critical when using this type of system. It is essential to consider the speed and simplicity of construction when choosing the fabric (Albadra, Coley and Hart, 2018).

The most prominent examples of this type are the temporary housing used to house Iraqi refugees in Iran after the Iran-Iraq war, developed by the architect Nader Khalili, depending on the soil available on the site and the sandbags in regular circular shapes, as shown in Fig. 7.

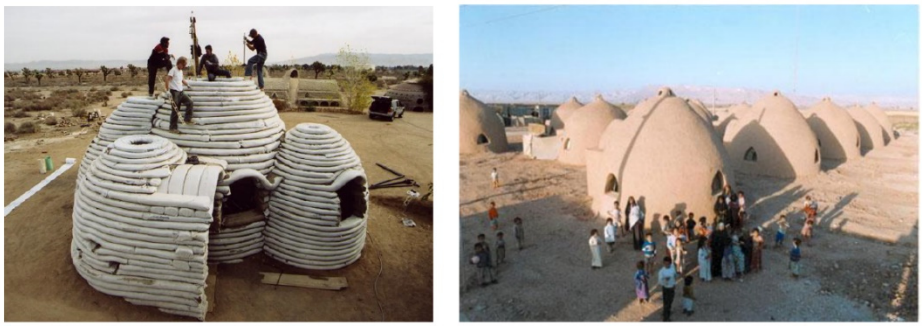

Figure 7. Sandbag housing for Iraqi refugees fleeing the Iran-Iraq war in 1995. Source: (AL AMEEN, 2017).

5. The Sustainability of Temporary Housing in The Context of Using the Prefabricated Building System

The urgency of disasters leads to displaced people or refugees seeking temporary housing quickly and inexpensively, often relying on standard production and technology-based solutions, so the results of temporary housing have often been ineffective in the short and long-term recovery.

Modular production based on prefabricated systems oversimplifies the temporary housing problem, often ignoring local cultural values , so these technologies fail because they rely on modular and technology-oriented solutions rather than people-oriented solutions (Félix, Branco and Feio, 2013). Barakat also emphasized that imported solutions impose designs that may be exotic, culturally inappropriate, expensive, and do not meet users' needs and expectations (Dikmen, Elias-Ozkan and Davidson, 2012). These solutions tend to be costly for the following reasons:

a. Need a transport and import process to reach sites where IDPs or refugees congregate, and transportation can account for up to two-thirds of the cost of materials (Félix *et al.*, 2013).
b. Usually, the local community does not know how to deal with new materials and technologies, so they need to hire people outside the area who know how to work with them.
c. Maintenance is very costly because users need to invest in imported materials and skilled labor to maintain their homes. Accordingly, this approach is not sustainable in the short and long term of the disaster recovery period. Because this method does not encourage people to invest in businesses and resources in the local

area, it does not help support the local economy.

Since the solutions offered by this type of building system are unsuitable, users try to make modifications to suit their lifestyle and needs, and since local users do not have the appropriate knowledge or skills to deal with new building systems and materials, these changes make the units more vulnerable to future disasters (Fig. 8). However, users usually cannot do home maintenance because it is expensive and requires specialized skills, which further degrades and weakens solutions over time. In the same way, inappropriate solutions often lead to population abandonment, for example, in the cases of Indonesia after the (1992) earthquake and India after the (1993) earthquake (Boen and Jigyasu, 2005). Sometimes the houses are empty because people refuse to move in, as happened in Turkey after the 2000 earthquake (Davidson *et al.*, 2007)and in Gujarat, India, after (2001) (Barenstein, 2006).

Figure 8. The housing unit before its use and after the user has modified it.
The modifications increased the weakness of the building. Source: (Félix *et al.*, 2015)

Although prefabricated systems have so many problems, this does not mean they should not be used at all, as newer construction technologies and new materials are undoubtedly more powerful resources for improving temporary housing solutions for disaster situations. The problem is how these resources are used, not the resources themselves. Properly introduced and culturally integrated, new building systems and materials can make post-disaster housing solutions safer and better for the people who live there. Table 1 summarizes the advantages and disadvantages of using this system (El-Masri and Kellett, 2001).

Table 1. Shows the advantages and disadvantages of prefabricated building systems.
Source :(The researchers)

	Sustainability aspects	
	Advantages	**Disadvantages**
Social	• Factories undertake to equip and build this type of housing. • Installation requires little equipment. Ease of site selection.	• It is challenging to modify or expand ready-made housing units. • In most cases, it does not involve community participation in the construction process. • Difficulty in meeting the diverse needs of disaster survivors.
		• Requires large storage spaces after use and for reuse. • The need for heavy equipment such as cranes for transportation and the construction of temporary housing units raises transportation costs and increases the difficulty of the matter. • The lack of integration of the original unit with subsequent additions or modifications. • Homogeneity and unification.
Environment	• Minimal waste because of mechanical and electrical component preprocessing. • Proper thermal insulation of temporary housing components to keep residents safe from changing weather conditions.	• Less reliance on recycled materials. • It is often difficult to reuse housing according to this type of system.
Econ	-	• The high cost, whether in terms of the cost of the units themselves or the cost of transportation.

6. The Sustainability of Temporary Housing in The Context of Using the Local Building Systems

Cultural acceptance of the type of housing and user satisfaction and participation in the design and construction process are the most critical factors for temporary housing solutions after a disaster (Lizarralde and Bouraoui, 2010). Considering these factors, developed local solutions according to the local building system available to users, their capabilities, expectations, and requirements. Therefore, this type of building system has a high level

of user satisfaction. Local resources are also valuable to livelihoods because they use community skills and local labor (Twigg, 2006). Active participation of the disaster-affected community can effectively restore a sense of pride and a good neighbor relationship to those impacted by disasters (Barakat, 2003). In addition, some local building systems may be more resistant to disasters when compared to some modern building systems because they are widely adopted in the local environment and, over time, tested and affected by local conditions such as climatic factors and culture (Shaw *et al.*, 2009; Gulahane and Gokhale, 2010). This way, users can build safe housing at the required speed through local knowledge, skills, and materials (Fig. 9).

Figure 9. Safe and straightforward temporary housing built with locally available materials by the local workforce, assembly, and maintenance are accessible because users know the building techniques and materials. Source: (Félix *et al.*, 2013)

With all the advantages mentioned above, we should pay attention to some of the disadvantages that characterize local building systems, as some temporary local solutions and technologies do not rely on knowledge and construction methods traditional, do not follow the requirements of safe construction, and use low-quality materials for buildings (Boen, 2007). This local solution has performed exceptionally poorly during past disasters due to its poor structural strength, resulting in many deaths and damage worldwide. Therefore, not all local solutions based on local building regulations are acceptable models to follow. In the same way, studies have found negative results in some methods that rely on community participation (Lizarralde and Massyn, 2008). Thus, not all types of community or user engagement have good outcomes, so their attention should be local and carefully defined according to their abilities and skills (Davidson *et al.*, 2007). Finally, in the case of large-scale destruction, the mass consumption of local resources can lead to sudden shortages or interruptions in the supply of local materials and severe environmental impacts such as deforestation (Corsellis and Vitale, 2008). Table 2 briefly summarizes the advantages and disadvantages of using a local building system.

Table 2. Shows the advantages and disadvantages of local building systems. Source: (The researchers)

	Sustainability aspects	
	Advantages	**Disadvantages**
Social	• Flexible solutions that them the freedom to add and modify inside and outside the house to meet the population's needs. • It can include a variety of functions and uses. • It involves community participation in construction and maintenance operations.	•May involve transportation and installation difficulties due to the weight of the building materials used and the need for special measures when storing and reusing them. •Using local building materials can waste time and require more skilled workers and special tools to build and maintain things.
Environ	• Materials and components can be easily recycled. • Various materials and techniques.	•Some systems may cause many local resources to run out, which affects the natural environment, like cutting down trees.
Economic	• Its cost is lower due to the use of locally available materials.	• Many of the materials used, such as bricks and concrete blocks, give a sense of permanence when used, which does not correspond well with temporary housing and raises questions about the rights of ownership of the land if a plan is not made in advance about its fate after its eviction by the residents.

Using both local and prefabricated building systems through a hybrid building system can help develop

culturally and locally appropriate solutions and be built and delivered quickly after a disaster, utilizing the characteristics of precast building systems in the field.

The paper tube houses developed by Shigeru Ban are an excellent example of what can be considered a hybrid approach between local and turnkey systems (Fig. 10), with the first design being developed for use after the Kobe earthquake in Japan (1995) and the second after the Gujarat earthquake in India (2001) (Yüksel, 2012). The house's structure consists of an array of prefabricated paper tubes and uses locally woven mud and reed mats for the roof. Table 3 shows the advantages and disadvantages of using a mixture of prefabricated and local building systems**.**

Figure10. Tubes House: (left) the solution used in Japan and (right) the solution used in India. Source: (http://ismetbirman-shigeruban.blogspot.com/p/houses-and-housing.html)

Table 3. Shows the advantages and disadvantages associated with the use of hybrid building systems. Source: (The researchers)

	Sustainability aspects	
	Advantages	**Disadvantages**
Social	• Ease of addition and modification to serve the needs of the beneficiaries. • Ease of installation, disassembly, and maintenance. • Speed of assembly on site. • Involves community participation in construction and manufacturing processes. • Ease of transportation, including the ability to move more than one house at a time.	• Some systems may have a lot of parts and components that need special tools, equipment, and skilled labor to put together, which can make them more expensive.
Environmental	• There is a high possibility of reusing and recycling construction materials.	-
Economic	• Compared to the cost of closed prefabricated systems, hybrid systems are less expensive.	-

7. Conclusions

The study shows that the problems of temporary housing still exist in post-disaster scenarios and that the basis of these problems is due to the method of developing design solutions and focusing on technical aspects only while neglecting cultural and local elements. The research shows that it is possible to use both local and prefabricated building systems to produce sustainable solutions for temporary housing projects after a disaster, as local systems have lower costs and environmental impacts, while prefabricated solutions have a higher potential to achieve better technical performance. Domestic building systems can best balance ecological impact and price, but their structural design takes longer.

According to research, using local and prefabricated building systems balanced and with people-oriented design rather than physical and technical aspects is the best way to make temporary housing more successful and sustainable after a disaster.

References

Albadra, D., Coley, D. and Hart, J. (2018) ‘Toward healthy housing for the displaced’, *The Journal of Architecture*,

23(1), pp. 115–136.
Alhabbal, D. A. (2019) 'Temporary Houses from Emergency to Sustainability'.
AL AMEEN, F. (2017) 'Exploring Sustainable Strategies for Shelter Design at Refugee Camps: The Case of Domiz 1 Refugee Camp in Iraq'. The British University in Dubai (BUiD).
Bajgiran, F. (2018) 'Sustainable mobile architecture for natural disasters with reference to the experience of the Bam earthquake'. Manchester Metropolitan University.
Barakat, S. (2003) 'Housing reconstruction after conflict and disaster', *Humanitarian Practice Network (HPN)*, 44(43), pp. 1–37. Available at: www.odihpn.org.
Barenstein, J. D. (2006) 'Housing reconstruction in post-earthquake Gujarat, a comparative analysis', *Humanitarian Practice Network, Network Paper*, 54.
Boen, T. (2007) 'Engineering the non engineered houses for better earthquake resistance in Indonesia'.
Boen, T. and Jigyasu, R. (2005) 'Cultural considerations for post disaster reconstruction post-tsunami challenges', in *UNDP Conference*, pp. 1–10.
Corsellis, T. and Vitale, A. (2008) *Transitional settlement and reconstruction after natural disasters*. Office for the Coordination of Humanitarian Affairs (OCHA).
Davidson, C. H. *et al.* (2007) 'Truths and myths about community participation in post-disaster housing projects', *Habitat international*, 31(1), pp. 100–115.
Davidson, C., Lizarralde, G. and Johnson, C. (2008) 'Myths and Realities of Prefabrication for Post- disaster Reconstruction', *4th International i-Rec Conference 2008 Building resilience: achieving effective post-disaster reconstruction (TG 63 - Disaster and The Built Environment)*, (May), p. 14. Available at: http://www.sheltercentre.org/sites/default/files/IREC_MythsAndRealitiesOfPrefabricationForPostDisasterReconstruction.pdf.
Dikmen, N., Elias-Ozkan, S. T. and Davidson, C. (2012) 'Comparison of post-disaster housing procurement methods in rural areas of Turkey', *Open House International*.
El-Masri, S. and Kellett, P. (2001) 'Post-war reconstruction. Participatory approaches to rebuilding the damaged villages of Lebanon: a case study of al-Burjain', *Habitat International*, 25(4), pp. 535–557.
Fallahi, H. & (2007) 'Strategies for the reuse of temporary housing', in *Urban Transformation—Holcim Forum*, pp. 325–331.
Félix, D. *et al.* (2013) 'The role of spontaneous construction for post-disaster housing'.
Félix, D. *et al.* (2015) 'The role of temporary accommodation buildings for post-disaster housing reconstruction', *Journal of Housing and the Built Environment*, 30(4), pp. 683–699.
Félix, D., Branco, J. M. and Feio, A. O. (2013) 'Guidelines to improve sustainability and cultural integration of temporary housing units'.
Gulahane, K. and Gokhale, V. A. (2010) 'Design criteria for temporary shelters for disaster mitigation in India', in *Participatory design and appropriate technology for disaster reconstruction. Conference proceedings*.
Hany Abulnour, A. (2014) 'The post-disaster temporary dwelling: Fundamentals of provision, design and construction', *Hbrc Journal*, 10(1), pp. 10–24.
Hosseini, S. M. A. (2016) 'Sustainability in the Post-Disaster Temporary Housing Management for Urban Areas', (September), p. 215.
Humanity, A. for (2006) 'Design like you give a damn : Architectural Responses to Humanitarian Crises', *Metropolis Books*, p. 333.
Johnson, C., Lizarralde, G. and Davidson, C. H. (2006) 'A systems view of temporary housing projects in post-disaster reconstruction', *Construction Management and Economics*, 24(4), pp. 367–378. doi: 10.1080/01446190600567977.
Kreimer, A. (1979) 'Emergency, temporary and permanent housing after disasters in developing countries', *Ekistics*, pp. 361–365.
Kreuzer, F. M. (2010) 'Innovation and Sustainable Development in Refugee Camps Concrete Action: Twin-pit ventilated improved pit latrine and large ferro-cement water tank', *Consilience*, (3), pp. 85–101.
Lizarralde, G. and Bouraoui, D. (2010) 'User's participation and satisfaction in post-disaster reconstruction', in *Participatory design and appropriate technology for disaster reconstruction. Conference proceedings*.
Lizarralde, G. and Massyn, M. (2008) 'Unexpected negative outcomes of community participation in low-cost housing projects in South Africa', *Habitat international*, 32(1), pp. 1–14.
Potangaroa, R. (2015) 'Sustainability by design: The challenge of shelter in post disaster reconstruction', *Procedia-Social and Behavioral Sciences*, 179, pp. 212–221.
Sagiroglu, M. and Memari, A. M. (2018) 'Learning from the Experiences of Using Different Types of Temporary Housing Systems', in *Proceedings of the 42nd IAHS World Congress, Naples, Italy*, pp. 10–13.
Shaw, R. *et al.* (2009) 'Indigenous knowledge: Disaster risk reduction, policy note', *Bangkok: UNISDR Asia and the Pacific*.
Twigg, J. (2006) 'Technology, post-disaster housing reconstruction and livelihood security', *Disaster studies*

working paper, (15).
Wagemann, E. (2012) 'TRANSITIONAL ACCOMMODATION AFTER DISASTER: Short term solutions for long term necessities'. Department of Architecture, University of Cambridge.
Yüksel, Y. D. (2012) 'Architetural assessment to emergency housing patterns'.