International Journal of Digital Innovation in the Built Environment
Volume 11 • Issue 1

Systematic Evaluation of the Emergency Accommodation Potential of Existing Public Buildings:
A Case Study in Istanbul

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ABSTRACT

Adaptive reuse (AR)—the process of adapting existing buildings for new purposes—can be an effective post-disaster strategy to shelter displaced people in densely built environments. As the literature documents no systematic tools to measure the suitability of existing buildings as collective shelters, this paper presents a multi-criteria shelter assessment tool (CS/ARP) for pre-disaster and rapid post-disaster uses. The study aims to discuss the CS/ARP methods' potentials and to provide evidence-based arguments for proactive disaster preparedness along with possible BIM and GIS connections. The proposed tool was tested through an in-depth case study involving the assessments of three school buildings in Istanbul. The assessments containing 119 categorized criteria under scorable assessment forms facilitate the selection of the best building options among alternatives in a predetermined urban area. Decision-makers, designers, and researchers may benefit from the proposed assessment approach focusing on the temporary use of existing buildings with high digitalization potential.

KEYWORDS

Adaptive Reuse, Building Performance Assessment, Disaster Preparedness, Multi-Criteria Decision-Support Tool, Post-Disaster Shelter, School Buildings

INTRODUCTION

Sheltering the victims is a fundamental problem in the aftermath of natural disasters such as earthquakes. In emergencies, governments typically implement conventional strategies base on unit-based solutions which involve tent cities and prefabricated houses. However, due to environmental durability, long production and shipping times, hard installation processes, high unit costs (UNHCR, 2007), or lack of suitable land, these options may not meet a sudden shelter demand, particularly in dense urban areas. As a response to this problem, temporary adaptation or adaptive reuse of existing structures can be a long-term, low-cost, and quick-response solution to meet the post-disaster sheltering needs of disaster victims in such areas.

Referred to as collective centers (CC) or mass shelters, pre-existing structures such as schools and sports halls are the most common examples of building adaptation in emergencies. In addition,

DOI: 10.4018/IJDIBE.294446
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many public buildings and community facilities including hotels, community centers, hospitals, factories, religious buildings, military barracks (UNHCR & IOM, 2010), town halls, gymnasiums, warehouses (Corsellis & Vitale, 2005; Sphere Association, 2018), and even unfinished buildings can be re-functioned as temporary collective centers. Although short-term (3-15 days) use of collective centers is recommended (UNHCR, 2007), existing buildings may often require longer-term use than expected. The main reason for this is the long preparation period for more suitable accommodation options. The examples indicate that the establishment of refugee camps with a capacity of 5000 people in Turkey took between 45-60 days. At first glance, it seems like an inadequate solution as long-term sheltering in CC's brings with it various risks. Yet, the UNHCR and IOM (2010) document posits that collective centers with proper selection, quality maintenance and life-supporting service infrastructure can offer an adequate temporary solution. However, a quick review of the relevant disaster literature reveals a lack of comprehensive studies for the systematical analysis of the existing building performance as post-disaster shelters and making rapid and effective selections. Previous studies commonly focus on temporary settlement site selections and selection criteria (Omidvar et al., 2013), unit-based shelter design and design criteria (da Silva, 2007; Sener & Altun, 2009), or life-cycle of shelter units (Arslan & Cosgun, 2008). A few of the current guides are largely management-oriented and they include a simple shelter checklist (American Red Cross, 2012; Martínez & Navaza, 2013).

This paper addresses sheltering as a complex design and decision-making problem and considers various scales such as shelter unit, building, and urban scale to analyze the shelter performance in-depth. In particular, the negligence of the design and building scale may result in inadequate collective shelters such as in Lebanon, Iraq, Syria, or Yemen (Christensen, 2015). The living conditions in these examples are below the minimum humanitarian standards (Sphere Association, 2018). In the absence of clear assessment criteria and comprehensive assessment tools focusing on collective shelters, this study presents a collective shelter adaptive reuse potential (CS/ARP) assessment model to fulfill the gap.

In order to bridge the existing gap between AR potentials and existing practices, this study employs a mixed method design to assess the existing buildings both with qualitative and quantitative properties. Developed by the comprehensive examination of various assessment tools, the proposed CS/ARP model is based on a pre-disaster assessment framework and a decision support tool that brings together the expertise of urban planning, architecture, engineering, real estate evaluation, and disaster management fields. The proposed model is expected to facilitate interdisciplinary cooperation among these disciplines. The model uses scorable assessment forms with a set of performance criteria compiled from earlier studies. The assessment forms consist of the preliminary veto assessment and further assessments in 5 categories: locational, architectural, technical, financial, and user-related. The proposed CS/ARP model was tested through the case studies of three school buildings in Istanbul (Turkey) located within the earthquake impact zone of the North Anatolian Fault Line (NAFL).

The results of the CS/ARP assessments in this study may guide designers, engineers, researchers, and decision-makers in:

- Assessing the appropriateness of buildings and selecting the best alternatives as emergency/temporary collective shelters.
- Identifying the flaws of the buildings and risks over disaster victims during use.
- Providing background for making cost estimation to correct these flaws.
- Decision-making as a decision support tool.
- Strategy development by gathering information about the current state of the building.
- Designing better with disaster awareness in a built environment.
- Linking the proposed model with BIM and GIS solutions in the context of smart city applications.

After a brief review of the adaptive reuse and disaster literature, the following sections explain the development stages of the criteria list, the assessment forms, and the testing of the model.