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Temporary Homes in Disaster Hit Areas

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Abstract. Temporary housing plays a critical role in post disaster recovery efforts but due to their unsustainability, cultural inadequacies, and being expensive they are not seen as a suitable resolution. Thus, due to the need of an integrated and more responsive strategy has becomes evident to better utilize the recovery and relief resources. The aim of this research is to explore use of the temporary housing in the post-disaster situations by addressing both physical and psycho-social safety/health issues and potential solutions to improve implementation of temporary housing. Furthermore, this research determines the, re-use and recycle, potential of temporary housing units after occupancy in post-recovery areas. This research also tries to identify how deconstruction is utilized and the benefits in post-disaster situations and determine the role and effectiveness of community participation during the post-disaster recovery situations. In the first part, this paper introduces the topic, then delivers the state of the art literature survey. Paper also justifies the chosen methodology followed by discussion and conclusion.

Keywords: Temporary Homes, post disaster situation, Issues and criticism of temporary housing

1 Introduction

Natural disasters seem to occur more frequently in today's world. Perhaps this can be attributed to the global connectivity provided by the internet where news and information about events are readily accessible to the global populace rather than constrained to the affected region. In addition to the apparent frequency of events, the world population continues to grow which increases the likelihood of natural disaster affecting more people. In order to combat this, emergency management agencies have designed relief and reconstruction programs to rebuild areas that are destroyed.

Often, use of temporary housing after large scale disasters has been criticized due to unsustainability and cultural inadequacies [1], Also, for being overly expensive, lacking in timely response effort after the disaster, and held responsible for undesired impacts on urban environments [2]. Agencies, such as the Federal Emergency Management Agency (FEMA) and the Mid-American Earthquake Center (MAE Center), within the United States utilized Disaster Impact Software to enable emergency planners to estimate potential displacement to people after a natural disaster,

however, these systems lack the ability to quantify and provide actionable solutions to address the temporary housing need [3].

Following the 1999 earthquake disaster in Duzce, Turkey, the post-disaster region suffered from a variety of issues [4]. The need for integrated management became evident, during the recovery and relief effort, in order for emergency planners to effectively utilize resources [4]. Optimally, temporary housing would form a sustainable community capable of maintaining itself socially, economically, and environmentally over time [4]. For this to be viable, temporary housing must be constructed out of materials that are re-usable and which are derived from materials which required reduced energy to make [4].

2 Literature Review

Disasters result in the devastations of the houses and require the urgent or temporary housing solutions for homeless families. Temporary housing is a broad concept; it ranges from large-scale temporary buildings, built by the government after a disaster, to hotels, apartments, friends or family, and all places where displaced families or individuals could live temporarily [5]. Temporary housing plays a critical role in post disaster recovery efforts since they provide shelter and solace, allowing the victims to begin recovering and continuing with their lives [1]. The reconstruction process of permanent housing can take considerable time, often several years to complete [1]. This time gap between full post-disaster recovery and reconstruction is bridged by temporary housing programs [1]. Temporary buildings could range from modular prefabricated building, to warm tents or self-built shelters, and may or may not have integrated supply chain to deliver these solutions (Khalfan, et al 2004). However, due to their impartialities families are unable to resume daily life and activities. Furthermore, the rapid decay of temporary shelters place high emphasis on the importance of temporary housing [1].

Use of temporary housing after large scale disasters has often been criticized due to unsustainability and cultural inadequacies [1]. Problems in sustainability are expressed in two ways: cost, and environmental issues. Often, the temporary housing solutions were not produced in the region where the disaster occurred, thus remains expensive due to high material and transportation costs. Cultural inadequacy plays a role in the inadequacy problem of temporary housing [1]. Often, the response for meeting the sudden demand for large quantities of temporary housing units has been solutions which employ standardization, technologically oriented, and reasonably cost effective. However, due to the cultural misfits, the standard solution is not feasible because it ignores the real needs of the user, variation in cultural values and housing form, variation in family size, etc. [1]. Moreover, temporary housing programs have also been reported as health hazards due to the presence of several forms of contamination [3].

In response to large scale natural disasters, emergency management agencies attempt to provide adequate temporary housing solutions needed to provide shelter and space for displaced persons. Agencies such as the Federal Emergency Management Agency (FEMA) and the Mid-American Earthquake Center (MAE Center) within the United

States utilized Disaster Impact Software to enable emergency planner to estimate potential displacement to people and families after a natural disaster. Various impact assessment software systems have been developed to aid and support decision makers during disaster preparedness and recovery efforts [3]. Systems such as Mid-America Earthquake Center system (MAEviz) and Hazards United States-Multi-hazard (HAZUS-MA) enable planners to estimate damage to housing in the disaster area and estimate the displacement of families in the aftermath of potential disasters. Although these systems are useful, they lack features necessary for optimizing temporary housing arrangements, which can benefit from and build on capabilities of these systems in estimating post-disaster displacement of families, and identify the optimal temporary housing plans to meet the specific disaster and cultural needs [3].

Systems such as these are being developed and certain components have been integrated with MAEviz to give decision-makers support in identifying optimal post-disaster temporary housing arrangements. These systems are designed to optimize tradeoffs among multiple objectives criteria such as minimizing negative socioeconomic impacts on the displaced families, maximizing public safety by minimizing vulnerability of displaced families, minimizing the negative environmental impact of temporary housing on the host communities, and minimizing total public expenditures [3]. While these four objectives are very important, the system is designed to allow decision-makers at emergency management agencies to define other user-defined optimization objectives[3].

The temporary housing automated system uses three separate models, a data collection model, and automated optimization model, and an output analysis and visualization model [3]. The data collection model is designed to collect and store housing, location characteristics and displaced family data. The data should be collected and stored in the data model during the preparedness and response phase [3]. Emergency management agencies can then update important data on all available temporary housing alternatives, reduce the time and cost associated with collecting the data after a disaster, and anticipate potential shortages in temporary housing at any location [3]. The collected data enables the decision makers to develop configurations to achieve their objectives [3]. Finally, the output analysis and visualization model allows decision-makers to analyze generated tradeoffs and their performances in achieving the temporary housing objectives; visualize the generated solutions and their corresponding configurations of temporary housing arrangements; and select the optimal temporary housing implementation plan that best serves the objectives of public (Figure 1) [3].

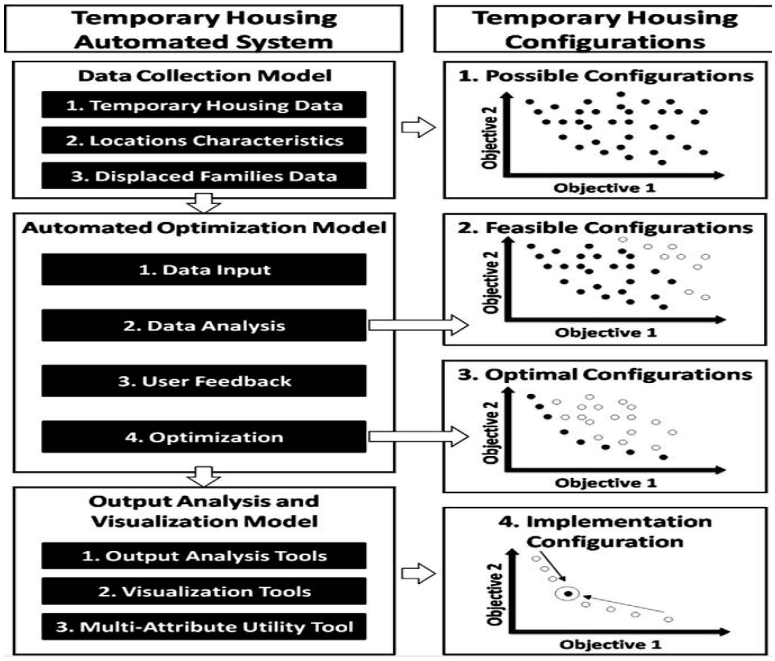

Fig 1: Temporary housing model [3].

Safety Management of the Temporary Community

Following natural disasters, construction of large scale temporary housing projects are needed in order to assist with the disaster relief effort [5]. Hui (2012) described four distinct phases of post-disaster reconstruction: emergency shelter, temporary shelter, temporary housing, and permanent housing. Quite often, the terms "housing" and "shelter" are used interchangeably with little distinction, but these two terms are quite distinct and separate from each other [5]. In the United States, temporary building most often means prefabricated buildings and give refuge to displaced individuals and family after natural disasters [5]. Several factors affect the safety of the temporary communities, but given the nature of temporary housing communities site safety and fire risk are most prevalent [5]. To increase site safety and reduce fire risk, the following recommendations were given [5].

- Prepare for the post-disaster temporary housing ahead of schedule [5].
- Pre-disaster preparedness is the most important prerequisite for being able to rapidly choose safe and suitable locations for temporary housing as well as determine the optimal temporary housing unit needed [5].
- Diversity among post-disaster temporary housing by increasing the different types of temporary housing used [5].
- In addition to timber framed housing units and reinforced concrete structures, certain kind of hotels should be considered in the scope of temporary housing

options [5].

- Utilize enhanced management tools to ensure stable transition after the disaster [5].

The Psychological Effects of Temporary housing

Prior to the 1997 earthquake in Marche, Italy, research had not focused on the impact of the how temporary housing affected secondary stress factors [6]. The psychological effect of disasters, earthquakes have been extensively studied by environmental psychologists, clinical psychologists, psychiatrists, and epidemiologists [6]. Following a natural disaster, losing one's home contributes to the most important and primary stress factors with relocating to temporary housing becoming a highly relevant and secondary source of stress. People, whose homes were destroyed, suffered greater stress and psychological destabilization than those who home simply needed repair. Except for cases where the destruction is so considerable that relocation is unavoidable, it is considered by researchers, that keeping survivors in their original environments, is most preferable [6].

Two types of units were set up as temporary housing for the displaced families i.e. mobile homes and wooden dachas [6]. The mobile home is, made of metal roof containers, considered the typical prefabricated housing unit made available to victims of the natural disaster in Italy. The second type of temporary housing, the wooden dachas, is rarely used for earthquake victims, resembles a prefabricated weekend cottage. There were two major distinctions that separated the dachas from the containers, they were made of wood rather than metal, and their shape resembled regular houses in the sense they had pitched roofs and large windows typical of Italian single-family housing.

Types of the temporary units also have the psychological impacts on people. For example, those who lived in the dachas were found to be more attached and satisfied than the ones living in the temporary housing units [6]. Comparatively, these individuals felt similar levels of psychological stress as measured against individuals who had returned to and lived in their original homes immediately following the disaster. These individuals also felt more dominated by the situation and exhibited more psychological stress symptoms. The attitudes towards their temporary home and the psychological wellbeing of the people who were housed in the containers were worse off than those living in the dachas [6]. Natural disasters like this often cause psychological disorders such as post-traumatic stress and depression [7]. For example, in 2011, survivors from tsunami strike in Japan often, suffer from physical, mental, and economic distress resulting in the increase of suicide rates in the post-disaster areas [7].

Post Disaster Housing Reconstruction

Post-disaster reconstruction is one of the most evident ways for agencies, organizations, and governments to show that resources are being spent and aid is being delivered [2]. In many cases it is common to find temporary houses have been built faster or even ahead of other related infrastructure [8]. Unfortunately, underestimates in the reconstruction complexity, in post-disaster reconstruction is a technical problem of delivering quickly and cheaply the greatest number of houses. Often centralized project

planning and management, which may be successful, suffers from lack of local participation in the rebuilding process.

The post construction is not short of dilemmas. In 2004, Sri Lanka was struck by a tsunami. Days later, the government announced a "no reconstruction" buffer zone along the coastline and repair or reconstruction of homes within this zone was prohibited [8]. Approximately 10 months later, the government revised the buffer zone policy citing land scarcity issues as the primary reason for reconsideration [9]. Although the idea of installing a buffer zone to protect against over-development, removing population form hazard-prone areas, and an effective way to preserve coastal ecosystems [9]. Forced relocation of families has resulted in unfavorable social conditions with economic, and cultural classes disrupt community networks, which are crucial for fostering adaptation and learning from a disaster. However, protection of the coastal environment is critical since coastal natural resources are fundamental components to livelihoods and security as a physical protection from tsunamis, storms, and erosion [9].

Although, the right to adequate housing has been acknowledged as a basic human right by a wide range of international legal instruments and declarations, disaster responses have not adequately addressed the housing needs of the poor including low-income renters [9]. It is necessary to ensure low-income tenants have practical housing recovery option following a disaster. The issues get worse due to the attraction of new migrants to cities, putting more pressure on the rental housing market and further affecting rent prices [10]. Thus far, direct assistance to tenants in the form of rent vouchers or allowances has been mainly used in high-income countries during recovery efforts following a natural disaster. This strategy has the potential to create an incentive for the development of the private sector rental market and can give households the independence to choose their recovery pathways [10].

Re-design, re-use and recycle of temporary houses

Applying the concept of re-use to temporary housing following a disaster appears beneficial to the overall recovery effort by presenting opportunities for accelerated reconstruction for the affected regions [4]. Designing for the reuse and recycling of buildings and its materials acknowledges the lifecycle of buildings from material extracted from natural resources through materials recovered by recycling or reuse. The lifecycle approach to design requires that ecological, social, and economic impacts be understood across the lifetime of the product, process, material, technology or service [4]. Therefore, the impacts of these conflicting variables must be considered throughout the lifespan of the building from the site selection process, to design, construction, operation, and the eventual demolition [4].

Following the 1999 earthquake disaster in Duzce Turkey, the post-disaster region suffered from a range of issues such as, economic, environmental, and social problems in addition to mass homelessness [4].

Deconstruction in Disaster areas: Psychological, environmental, economic and social impact

Currently, the most common way to deal with the destruction of urban environments following a natural disaster is to utilize large equipment for demolition, removal and

deposit of debris in landfills. An alternative to this method is to employ "deconstruction" which utilized hand dismantling of buildings to extract the maximum salvage material to be reused for reconstruction [10]. In 2005 the Gulf Coast was hit by three major tropical storms, Hurricane Dennis, Hurricane Katrina, and Hurricane Rita [11]. These storms turned the Gulf Coast into a veritable wasteland with nearly $100 billion in damaged structures, including severe or total destruction of nearly 275,000 homes [10]. The Federal Government responded to this disaster by demolishing homes and buildings where damage exceeded 51% of fair market value [10]. On occasion, this demolition occurred without prior notice to the owner and sometime inadvertently included demolition of houses that were undergoing renovation [10]. This caused great stress and anxiety for many home owners, especially to impoverished families whose broken home was the vast majority of their wealth, in wondering if their home would be next [10].

Mercy Corps, an International non-profit, humanitarian relief and development agency implemented a deconstruction program in New Orleans following the hurricanes of 2005 [10]. This program offered building owners an alternative to demolition, allowing low-income property owners the ability to retake control of their property and salvage value form their homes [10]. Mercy Corps' main goal with the deconstruction program in New Orleans was to provide inexpensive building materials for low-income residents who wanted to return and rebuild their homes [10]. Mercy Corps' response to the disaster that devastated the Gulf Coast marked the first time the agency provided large-scale sustained disaster relief in the US [10]. Over 70% of the homes in New Orleans were either completely destroyed or severely damaged [10]. The Louisiana Department of Environmental Quality estimated that 30 million cubic yards were scattered across New Orleans. Those who returned to the city were faced with high unemployment rates and a scarcity of construction materials for rebuilding [10]. This was further complicated by inflated prices for materials that were available.

3 Methodology

This research focuses on qualitative data. Initial, the focus of research as aimed at collecting scholarly reports focusing on keywords such as temporary housing, disaster hit areas, sustainability of temporary housing, re-use and recycle of temporary housing, and effects of temporary housing. Zotero, a Mozilla Firefox web bourse add-on tool was used to capture downloadable pdf files and capture the metadata for the file. During the initial collection phase, abstracts of articles were briefly read to determine whether the article could contain relevant data. Articles that seemed remotely related were captured using Zotero. After the initial collection phase, articles collected were read thoroughly to ensure relevance to the topic of this paper. Sources were organized based on similar contents with sources which did not contain relevant data set aside (see Table 1). Following the initial data review, key words (Katrina, post-disaster deconstruction, deconstruction vs. demolition) were added to the search to find new relevant material. During the secondary data collection phase, sources were carefully reviewed to ensure the content was relevant. Irrelevant data was not captured via

Zotero. An extensive literature review was completed to provide background and relevance for discussion.

Table 1:

Research Objective	Source type	Authors	Data collection stage		Applied Data	Data
			Initial	Secondary	Final	Not Used
Objective 3: Re-use	Journal Entry	Arslan, H (2007)	X		X	
Objective 3: Re-use	Journal Entry	Arslan, H, et al. (2008)		X	X	
Did not apply	Journal Entry	Bolin, R, et al. (1991)	X			X
Objective 2: Psychological effects	Journal Entry	Caia, et al. (2010)	X		X	
Did not apply	Universiy of California	Comerio (1998_	X			X
Objective 5: Role of community	Journal Entry	Davidson, et al. (2007)	X		X	
Objective 4: Deconstruction	Journal Entry	Denhart, H. (2009)		X	X	
Objective 4: Deconstruction	Journal Entry	Denhart, H. (2010)		X	X	
Objective 1: Issues and criticism	Journal Entry	El-Anwar, et al. (2009)		X	X	
Objective 2: Psychological effects	Government Report	Farris (n.d.)	X		X	
Objective 1: Issues and criticism	Journal Entry	Félix, et al. (2013)	X			
Did not apply	Journal Entry	Abulnour (n.d.)	X			X
Objective 2: Psychological effects	Journal Entry	Hui (2012)	X		X	
Objective 1: Issues and criticism	Journal Entry	Ingram, et al. (2006)	X		X	
Objective 2: Psychological effects	Journal Entry	Johnson (2007)			X	
Objective 1: Issues and criticism	Journal Entry	Johnson, et al. (2012)			X	
Did not apply	Journal Entry	Levine, et al. (2007)	X			X
Objective 2: Psychological effects	Journal Entry	Matsubayashi, et al. (201	X		X	
Did not apply	Journal Entry	Nigg, et al. (2006)	X			X
Did not apply	Journal Entry	Olshansky (2006)	X			X
Did not apply	Journal Entry	Shaw, et al. (2004)	X			X
Objective 1: Issues and criticism	Journal Entry	Taheri, et al. (2013)	X		X	
Did not apply	Journal Entry	Yarnal (2007)	X			X

4 Discussion

Issues and criticism of temporary housing

It is clear that following a natural disaster the relief response needs to be quick and direct [3]. Emergency management agencies are often under intense pressure to respond quickly, and limit the burden of expense on the public [3]. This often drives the top-down view of the technically oriented solution [8]. Each disaster is uniquely different based on type of disaster, area of effect and cultures present within the affected area, and in terms of local resource availability. In order to prepare and answer each disaster with a unique and individual solution pre-disaster planning for disaster preparedness and recovery efforts is paramount [3]. Preparing for disaster allows emergency agencies to fully understand the cultural, social, economic differences, and local resource availability within the country and give the best chance for crafting a timely, unique, and direct solution to respond to disasters.

Attitudes towards ones temporary home may play a role in psychological wellbeing following relocation from a natural disaster area [6]. Testing confirmed the idea that attitudes towards one's temporary home are largely responsible for psychological wellbeing and for psychological stress symptoms such as anxiety, sadness, and guilt [6]. Several studies support evidence that the risk factor for suicide increase after natural disasters in the same way that mental distress and economic hardships increase suicide risk factors [7]. Earlier studies have found earthquake victims are 46% more likely to commit suicide than non-victims [7].

There are several options for re-using and recycling temporary house after occupancy. Temporary houses and the housing site can be re-used in their existing place as future temporary houses for a future disaster [4]. Following the recovery effort in Duzce, Turkey, temporary housing sites were re-used as construction offices and workmen dormitories. Finally, temporary housing units can be deconstructed with minimum material loss and energy [4]. The deconstructed houses can then be sent to other disaster affected areas for re-assembly and re-use, or they could be sent to other location for re-assembly and re-used with a different function [4].

Currently there is a small but growing amount of literature contributing to on the environmental, economic, engineering, and technical aspect of deconstruction [10]. The concepts and utilization of deconstruction is slowly beginning to make is way through professional felids such as engineer, architecture, planning, and has gained slight attention form the non-scholarly research communities [10]. There is much to learn and case studies have yet to determine the overall impact of deconstruction and how it plays into the temporary housing program of disaster relief efforts.

Studies have shown that deconstruction is competitive with machine demolition [10]. This has been credited to the ability to re-use or re-sale building materials to recoup the large amount labor expense associated with careful dismantle of a structure. Typical demolition requires one skill machine operator to demolish a building, but deconstruction offers entry level jobs where workers can learn valuable skill to for those interested in pursuing skilled work in construction specialties [10]. There are issues with deconstruction relating to disaster areas that could impede its use [10]. Often, the urgency for quickly removing damaged structures and difficulty in disposing of waste debris make it difficult for deconstruction to compete with the efficiency of demolition [10]. Instead of competing as an alternative to demolition, deconstruction should be focused on become an integrated part of building decommissioning, whether in disaster response efforts or in everyday business [10].

Recently Communication participation has been encouraged widely. Non-Government Organizations, policy makers, and scholars widely encourage community participation in reconstruction efforts, however very little knowledge exists about how to apply the principles of community participation at the project level [11]. Case studies for post-disaster reconstruction projects have shown, the ideal of community participation takes on a number of forms, and in the majority of cases does not really reach reconstruction in the field [11]. This suggest there is a big gap between the theory of community participation and the practice [11]. Studies have also shown when participation occurs at late stages there are frequent problems with either the project process or with the project outcomes [11]. When engaged and participation is solicited and integrated in the upfront stages, studies show the community can have an important impact on the project with long-term advantages for the community and other stakeholders as well [11].

5 Conclusion

Temporary housing programs following large-scale natural disasters have been criticized for being unsustainable, culturally inadequate and needing a technical solution. Pre-disaster planning for disaster preparedness and recovery allows emergency agencies to fully understand the cultural, social, economic differences, and local resource availability within the country and give the best chance for crafting a timely, unique, and direct solution to respond to disasters. This further helps to improve the psychological wellbeing and disregard post-traumatic stress and depression and suicidal rates. Deconstruction emphasizes a hierarchy of material use, takes less energy and leaves a much smaller carbon footprint to use reclaimed materials than it does for demolition and disposal in landfills, creation of new building materials, or even to recycle materials for alternative. Deconstruction has a positive effect on the psychological wellbeing as well, by reducing feelings of sadness and vulnerability and fostering feelings of empowerment and excitement about rebuilding and moving forward. Finally, community participation is key to successful reconstruction efforts. However, there is a clear disconnect between the theory of optimal community involvement and the implementation of the practice [12]. Early involvement of the communication can help the participants to recover from unforeseen problems and positive impact on the project with long-term advantages for the community and other stakeholders as well.

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