

**科学研究費助成事業 研究成果報告書**

平成 27 年 6 月 11 日現在

機関番号：11301

研究種目：若手研究(B)

研究期間：2013～2014

課題番号：25871245

研究課題名(和文) International Comparison of Post-Disaster Transitional Housing

研究課題名(英文) International Comparison of Post-Disaster Transitional Housing

研究代表者

MALY Elizabeth (MALY, Elizabeth)

東北大学・災害科学国際研究所・助教

研究者番号：00636467

交付決定額(研究期間全体)：(直接経費) 1,400,000円

研究成果の概要(和文)：本研究では、三つの事例から仮設住宅から恒久住宅への移行期において高品質の住宅が住民の生活環境改善に貢献していることが確認された。ハリケーン・カトリーナ後に利用された移動型のミシシッピコテージや、東日本大震災後に使用された木造仮設住宅は、構造の再利用や仮設住宅供与策の将来に向けた改善の可能性を示した。インドネシアでは、大規模な住宅移転が行われたメラピ火山噴火の復旧において、ジャワ島中部地震後に使用された増築可能なコア住宅の原理が取り入れられる等、過去の災害からの教訓が移行期の生活環境の改善に貢献した。

研究成果の概要(英文)：This research confirmed that in of the 3 case studies considered in this project, temporary or transitional housing that was of higher quality contributed to the improved living environment for residents during the temporary housing phase. The Mississippi Cottages, used after Hurricane Katrina in the USA, and wooden temporary housing used in Tohoku after the GEJE, demonstrate the potential for the reuse of these structures and the future improvement of the system for temporary housing provision. In Indonesia, lessons from past disaster contributed to improvements in living conditions in the temporary and permanent relocation sites. Housing recovery after the volcanic eruption of Mt. Merapi made use of the experience of community-based planning and principles of expandable core houses used after the Central Java Earthquake, and used expandable core housing as part of the large scale housing relocation.

研究分野：住宅復興

キーワード：住宅復興 仮設住宅 木造仮設住宅 ミシシッピ・コテージ メラピ火山 インドネシア

## 1. 研究開始当初の背景

In recent years, as large scale natural disasters have been occurring more frequently around the world, the need to help disaster survivors rebuild their homes and lives is more critical than ever. Housing recovery plays a key role in restoring lives of disaster victims. After the emergency shelter phase immediately post disaster, most housing reconstruction relies on some form of temporary housing to provide intermediate shelter until permanent housing reconstruction can be completed. The different problems and negative impacts that temporary housing can cause for disaster residents have been widely documented, from disruption of communities and social networks, negative effects health and psychosocial conditions, and a complete lack of connection to or support for residents to regain stable and permanent housing. Typical temporary housing is also a waste of resources, as it is disposed after use. In response to the to the gaps and waste of temporary housing, recently support has been increasing for the idea of transitional housing as a way to better support disaster victims through the housing reconstruction process.

*Transitional Housing Guidelines* defines transitional housing as a process within housing reconstruction that supports residents during the challenging period of recovery used first after the 2004 Indian Ocean Tsunami.<sup>1</sup> *Safer Homes, Stronger Communities*, from the World Bank, also supports transitional housing as benefitting the housing reconstruction process, which “begins immediately after the disaster.”<sup>2</sup> Transitional housing benefits residents by minimizing relocation and preserving the investment of time and materials that can be converted into permanent housing and not discarded. Housing structures can be transitional in many ways, for example: movable, reusable, transformable, or incrementally expandable. The recovery phase is the least-studied phase of the disaster cycle<sup>3</sup> and many experts specifically identified the need for more international comparative research on disaster recovery. Furthermore, there is a significant lack of international comparative analysis of transitional housing in reconstruction. This research carried out an international comparison study of the use and impact of transitional housing in cases of post-disaster reconstruction in Indonesia the U.S., and Japan.

1. Shelter Center, 2011. *Transitional Shelter Guidelines*. Geneva: Shelter Centre. p.15.

2. Jha, A.K., 2010. *Safer Homes, Safer Communities, A Handbook for Reconstructing After Natural Disasters*. Washington: The World Bank.

3. Berke, P. R. Kartez, J., and Wenger, D. 2003. "Recovery after Disaster: Achieving sustainable development, mitigation, and equity." *Disasters* 17 (2): 93-109.

## 2. 研究の目的

After the Central Java Earthquake (2006), expandable core house was used in Yogyakarta, incorporating transitional principles into permanent house reconstruction. After the volcanic eruption of Mt. Merapi in 2010 in the same region, core houses were used once again for housing recovery, along with temporary and permanent community relocation. Building on past research about the use of core houses in Yogyakarta after the Central Java Earthquake, one purpose of this research was to investigate the post-Merapi reconstruction program and the outcome of using expandable core housing in these communities.

After Hurricane Katrina in the U.S. (2005), temporary-to-permanent Mississippi Cottages were provided to some disaster survivors as temporary housing. The transition to permanent use was not as successful as planned, but the Cottages demonstrate flexibility for use and reuse. There are few published studies about the Mississippi Cottages as temporary or permanent housing. The researcher has been investigating the adaptation and conversion of Cottages from temporary to permanent use, and one purpose of this research is to continue to survey and document the long-term outcomes of the permanent use of Mississippi Cottages for disaster survivors in coastal Mississippi.

At the start of this research project, two years after the Great East Japan Earthquake, most survivors were living in various types of temporary housing. From the experiences after the Hanshin Awaji Earthquake in Kobe, the negative effects of temporary housing are widely known. In response to these issues, some alternative temporary housing has been built. One of the alternatives to typical pre-fabricated units, wooden temporary housing—used in Sumita Town, Rikuzentakata City, and in Fukushima Prefecture—represents an opportunity to incorporate the principles of transitional housing. One purpose of this research is to investigate the outcome of wooden temporary housing as a transitional strategy for the survivors of the GEJE.

Through the comparison these international cases of housing reconstruction using transitional aspects, this research contributes to a better understanding of transitional housing in the recovery process. In the early recovery phase after the Great East Japan Earthquake, there is especially a great need both to learn from examples of housing reconstruction in other countries, and also to share the outcome and lessons from Japan with the world.

### 3 . 研究の方法

The research combined qualitative and quantitative methods to investigate the three cases studies in the United States, Indonesia, and Japan. For all three cases, during field visits, interviews were carried out with key stakeholders from government and non-profit sectors, academic and community associations involved in the housing provision process, in the implementation of the respective projects, and in supporting the residents during the transitional housing phase. Although originally planned for each of the three cases, research relying on questionnaire surveys focused on the case of housing recovery after the volcanic eruption of Mt. Merapi in Indonesia, where respondents in resettlement sites were surveyed about their experiences with the housing recovery process.

### 4 . 研究成果

(1) Based on interviews and surveys with residents, and stakeholders involved in the design, implementation, and long term outcome of the Mississippi Alternative Housing Program, and the Mississippi Cottages created by this program and used in the United States after Hurricane Katrina, the results show that while this program demonstrated immense potential to address immediate and long term housing needs after disaster, the implementation, and especially timing and lack of coordination with local government lead to a significant reduction in the level to which the program could be applied. This was in spite of the fact that Cottages were well-built, meeting the goals of affordability and disaster (hurricane) resistance, and very popular with residents. Although only 1/3 of Cottages used as temporary housing were successfully converted to permanent use by residents, there are multiple examples of Cottage expansion by residents and non profits (Habitat for Humanity), and also reuse by non-profit developers (Mercy Housing) for affordable rental and owned housing. Unfortunately, the Alternative Housing Pilot Program did not lead to any significant developments in how temporary housing is provided post-disaster in the United States.

(2) In the case of housing recovery after the 2010 eruption of Mt. Merapi, the local and regional governments of Yogyakarta Special District successfully applied the lessons from the 2006 Central Java Earthquake in the same region to develop a housing recovery process that included collective relocation to temporary settlements, followed by collective relocation to new permanent settlement sites. An expandable core house was provided to beneficiaries within the resettlement sites, and also to those households who rebuilt on individual lots. Based on interviews with local government, academics,

program administrators, and local government, the use of the core houses as part of community-based housing reconstruction allowed for an efficient reconstruction process that included the community in multiple decision-making process, and maximized the available resources to support the beneficiaries. The varied designs of the houses allowed for residents to chose the house design that best matched their needs, and options for siting also made it possible for extended families to plan and coordinated the expansion of their houses together. Most residents were able to make modest extensions and add finishes (paint, flood tiles, veranda, roof) in the first few months or year following construction of the initial core house. However, some core houses remain in their original form, which suggests that the residents were unable to expand them. Others have been expanded several times, with additions such as garages or store spaces. Especially in the resettlement sites, the lot limits mean that many houses have already been expanded to the maximum possible area.

(3) In Japan, the use of wooden temporary housing demonstrates a significant improvement over the typical prefabricated emergency temporary housing used after disaster. In the case of Fukushima, it was found that the pre-disaster systems and efforts to use local products helped set the stage for the innovative use of wooden temporary housing. Based on interviews with residents and local community leaders, wooden temporary housing can be confirmed to be an improvement in terms of living environment and comfort. However, when faced with the long-term issues of nuclear evacuation, wooden temporary housing can play a very limited role.

In terms of the potential for long-term permanent use or reuse, which could be compared to the examples of the Mississippi Cottages in the US and the expandable core houses in Indonesia, the investigation of wooden temporary housing in Tohoku there are unfortunately few examples. In the case of Sumita Town in Iwate Prefecture, residents (who are mostly from coastal areas of neighboring towns) have the option to keep using the wooden housing unit, or reuse it for a different purpose, if they can relocate it themselves. Although several residents have or plan to do this, it seem like it is not practical unless the resident owns land nearby. In one successful example of reuse from Aizu-Wakamatsu in Fukushima Prefecture, wooden housing built as temporary units will be combined and reused as permanent Disaster Recovery Public Housing. Although this requires specific site improvements, and another temporary relocation of the residents, this project demonstrates that at least for a project

administered by the Prefecture level, reusing the wooden housing structure for permanent housing is viable. Unfortunately, this is not the case for many locations, where the condition of wooden structures built to temporary standards has deteriorated to the point where they cannot be reused for the long term.

Results of analyzing the impacts of the respective programs and their implementation were presented as academic papers and a keynote address at international conferences and became the basis for book chapters. Future publications in academic journals are also planned based on the findings of this research.

## 5. 主な発表論文等

(研究代表者、研究分担者及び連携研究者には下線)

〔雑誌論文〕(計1件)

(1) Maly, E. and Ishikawa, E. Planning for Relocation in Recovery after the Great East Japan Earthquake: Considering Residential Relocation in Historic and International Contexts,” 査読有, *International Journal of Disaster Resilience in the Built Environment*, 2014, Vol. 5 Is: 3, pp. 243 – 259.  
DOI: 10.1108/IJDRBE-01-2014-0014

〔学会発表〕(計6件)

(1) Maly, E., People-Centered Post-Disaster Recovery in Yogyakarta, 2nd International Symposium on Recovery after Mega-Disasters: People, Community, and Planning, 2015年3月16日, Tohoku University (Sendai)

(2) Maly, E., Temporary Housing Innovations after the Great East Japan Earthquake, 地域フォーラム「災害から4年-災害復興のこれまでと今度」2015年3月12日, 福島高専(いわき市)

(3) Maly, E. and Matsushita, T., Temporary Housing Innovations within the Post-Disaster Housing Process: an International Comparison, 3rd International Conference on Urban Disaster Reduction, 2014年9月30日, Boulder (USA)

(4) Maly, E. and Matsushita, T., Innovations in the Temporary Housing Phase of Disaster Recovery: Wooden Temporary Housing in Japan after the 3.11 Great East Japan Earthquake and Tsunami in an International Comparative Context, International Conference of Architecture and Planning in Indonesia, 2014年8月21日, Yogyakarta (Indonesia)

(5) Maly, E. and Ishikawa, E., Planning for Relocation in Recovery after the Great East Japan Earthquake: Considering Residential Relocation in Historic and International Contexts. International Conference on Disaster Management 2013年8月23日, Brisbane (Australia)

(6) Maly, E. and Kondo, T., People-Centered Housing Recovery: an Analysis of Post Disaster Housing Reconstruction Case Studies using the Concept of Transitional Housing, 6th International i-Rec Conference on Sustainable Post-Disaster Reconstruction From Recovery to Risk Reduction, 2013年5月28日, Ascona (Switzerland).

〔図書〕(計2件)

(1) Iuchi, K., Maly, E. and Johnson, L. Springer, “Rebuilding livelihoods after a tsunami: policies, programs and implementation in rebuilding from the Great East Japan Earthquake” in *Post Tsunami Hazards; Reconstruction and Restoration*, 2015, pp 29-46.

(2) Maly, E. Routledge, “People centered housing recovery in Tohoku.” in Hobson, C and Bacon, P. (Eds). *Human Security and Disasters*, 2014, pp 33-62

〔産業財産権〕

出願状況(計0件)

名称:

発明者:

権利者:

種類:

番号:

出願年月日:

国内外の別:

取得状況(計0件)

名称:

発明者:

権利者:

種類:

番号:

出願年月日:

取得年月日:

国内外の別:

〔その他〕

ホームページ等

## 6. 研究組織

(1) 研究代表者

MALY ELIZABETH (MALY, ELIZABETH)

東北大学・災害科学国際研究所・助教

研究者番号: 00636467

(2) 研究分担者

なし ( )

研究者番号:

(3) 連携研究者

なし ( )

研究者番号: