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An Incrementally Expandable Core House for Disaster Reconstruction:

Two Cases in Yogyakarta, Indonesia after the Central Java Earthquake

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The process of post-disaster housing reconstruction is a major factor for survivors to be able to regain stability in their lives, which is the underlying goal of disaster recovery. Along with the implementation of reconstruction programs, the form and the design of the housing itself can have a significant impact on residents' lives. In the process that starts from emergency shelter immediately after a disaster though the phases of recovery and ultimately to permanent housing reconstruction, the housing used in the temporary or transitional phase can play an especially pivotal role. After the Central Java earthquake that struck the city of Yogyakarta, Indonesia and surrounding region in 2006, the housing reconstruction process incorporated an incrementally expandable core house. This study looks at the outcome of the core houses in 2 different villages south of Yogyakarta, the pottery village of Kasongan, and a rural village of Tlogo in Kebon Agung. Differences in timing and funding sources for the implementation of the core houses in these cases resulted in different outcomes, and different levels of success in terms of expansion. Through this study we can understand both the potential of the core house in post-disaster reconstruction, and also the importance of coordinated implementation for its success.

Introduction

This study looks at the outcome of a housing reconstruction program in 2 villages where an expandable core house was used to complement official housing reconstruction in Yogyakarta, Indonesia after the Central Java Earthquake in 2006. Based on interview surveys in these two villages, and considering the different outcomes, this study evaluates the benefits and challenges of this form of housing reconstruction, and how core houses can complement the housing recovery process. The core house concept has been used in Indonesia for decades as part of affordable housing provision programs. In the post-disaster context after the Central Java Earthquake, the core house was used in various housing reconstruction projects as a way to quickly provide livable permanent housing to an increased number of beneficiaries. In the two cases discussed in this paper, the core house form was used by programs that supplemented government reconstruction. In the case of Kasongan village, where the core houses were provided with a special funding source early in the reconstruction process, residents were able to leverage these initial small housing units and use the reconstruction funds provided by the government to expand them. In the 2nd case, Tlogo in Kegon Agung, the core houses were provided through a corporate donation, and targeted residents who had been left out of the main official reconstruction process, which had already started. In this case, it was more difficult for residents to expand their core houses, and residents in Tlogo paid more for both the construction and expansion of their permanent housing. In both these two cases, the core houses were built along with or in addition to other houses provided as part of housing reconstruction, and allowed for increased flexibility in targeting beneficiaries, and through expansion, increased control of the residents over their own living environment.

1. The Central Java Earthquake

On May 27, 2006, at 5:54 a.m. a magnitude 5.9 earthquake struck the central part of the island of Java in Indonesia, near the city of Yogyakarta. 5749 people lost their lives, and 1,100,000 people's houses were destroyed. Most severe damage occurred outside the city center, in rural areas in the southern part of Yogyakarta City and Central Java, so government services and infrastructure were less affected.

1.1 Housing damage

In the rural villages where the damage was concentrated, most residents lived in single story detached houses on their own property, and most people intended to rebuild their houses on the own lot. Disaster survivors stayed close to their former homes, and many even placed tents used for emergency shelter within the ruins of their houses. According to the Preliminary Damage and Loss Assessment, 74% of people were staying in front of their own houses in the weeks after the earthquake.

1.2 Urgent Need for seismic-resistance housing

Many casualties were caused by building collapse especially of houses built using unreinforced masonry. Within a few months after the earthquake, people had started rebuilding their own houses. Since a low level of compliance with safe building standards, especially a lack of seismic reinforcement, was the cause of building damage and most loss of life in the earthquake, it was imperative that the reconstruction program addressed the issue of safe building practices, and did so in a timely manner, before local residents rebuilt their houses incorporating the same weaknesses as before the earthquake. As Nizam explains, many disaster survivors had already started to rebuild their homes within the weeks immediately following the earthquake, yet they were lacking technical knowledge of earthquake resistance construction.[1)]

2. The Context of Housing Reconstruction

Housing reconstruction after the Central Java Earthquake was managed by regional governments of Central Java and Yogyakarta Provinces, with financial support from the national Government of Indonesia (GoI). International donors and non-profit organizations also significantly contributed to housing reconstruction. The Java Reconstruction Fund (JRF) was set up to manage funds donated from the EU, Netherlands, UK, Canada, Finland, and Denmark, coordinated by the World Bank. From early in the process, local government acknowledged it would be difficult to meet the total housing need with existing resources, and demonstrated willingness to accept and combine other offers of support from outside; the resulting housing reconstruction process allowed for flexibility and various and multiple support from different sources.[2)]

2.1 Government Reconstruction

The main support for housing came from the Indonesian government, which distributed 5.4 trillion rupiah, (around $54 million US dollars) to help rebuilt 279,000 homes, and repair 253,000 others.[3)] The international donor funded JRF also contributed to housing reconstruction, mainly through the program called JRF-REKOMPAK (Community-based Settlement Rehabilitation Reconstruction Project) which planned to rehabilitate 15,153 houses in Yogyakarta and Central Java.[4)] Manfield's report of the Early cluster activity reports that the government funded the construction of 258,000 houses, and JRF 23,500.[5)] Within 1 year, 90% of permanent houses were complete.[6)]

2.2 Community-based Reconstruction Policy

The Government of Indonesia pledged aid to reconstruct 180,000 severely damaged houses, using a community-based approach. Instead of hiring outside contractors, the local government focused on residents and prioritization and delivery of housing reconstruction support was carried out with local community groups composed of 8-15 families, called *pokmas* (from *KelomPOK MASyarakat)* in Yogyakarta or and KSPM in Central Java.[7)] These groups prioritized the order in which beneficiary households would receive the new housing; vulnerable members of the community (widows, the elderly, families with very young children, or the very poor) received houses first, others in later stages. Facilitators were appointed to provide technical and social support for these groups.

The administration of the housing reconstruction program, which exclusively targeted homeowners, not renters, included three stages: preparation, identification, and development. Facilitators and consultants were identified and recruited in the first stage, which was also important for starting community organization for reconstruction. Eligible housing beneficiaries were identified in the 2nd stage, and community groups were established for the reconstruction process, and participatory planning efforts were carried out to create housing rehabilitation proposals.[8)] The 3rd stage was the actual construction of houses, carried out based on the planning and decisions of the residents themselves.

The government provided housing assistance in the amount of 20 million rupiah (around $2000 US) to each household in Central Java, and 15 million rupiah to each household in Yoygakarta special region. This difference the amount was due to the need for the budget to replace infrastructure in Yogyakarta, which had sustained more damage than Central Java.[9)] Although the benefit amount was calculated for each household, reconstruction funds were distribution of through community groups (*pokmas* in Yogyakarta and KSPM in Central Java). Each group was required to open a bank account, through which they received funds for reconstruction, called Direct Housing Assistance for the Community (BLMP), in several tranches.[10)]

Although the *pokmas* system was created after the earthquake for the purpose of distributing reconstruction funding, most local communities already had pre-existing neighborhood groups in place. Much of the rebuilding work was done by resident groups in turn, using the local tradition of *gotong royong*, a custom and practice of working together to resolve problems faced by the community. This local culture of mutual aid and cooperation lead to the success of this community-based recovery and a quicker recovery, in which the official government-sponsored housing recovery program was basically complete in less than 2 years, and many residents moved into their new houses even earlier.

2.3 Reconstruction including Transitional Housing

In the weeks following the earthquake, it became clear to the international and local organizations involved in planning the recovery process that there would be a gap in the time it would take to provide permanent housing for everyone who needed it. Because of the time needed to procure materials and In the *Transitional Shelter/Rumah Cikal Strategic Framework*, the Transitional Shelter Sub-Cluster and Emergency Shelter Cluster acknowledged that it would take several years to provide housing for the 300,000 households who needed it.[11)] In addition, the monsoon season was approaching. The Shelter Sector forum, which included UN agencies and other humanitarian groups, developed an overall 'roof-first' strategy, which translated into a focus on transitional shelter. Mainly provided by national and international NGOs, these transitional 'T-shelters' bridged the needs for housing between tents in the emergency phase and permanent housing.

2.4 The Core House Definition and Indonesian Context

A core house is an incrementally expandable form of housing. The core, which can be built quickly, needs fewer resources for initial construction; later on, residents can leverage their own funds or donations for expansion. For use in a disaster area, core houses are one option for permanent reconstruction that can support residents' ability to return to a stable housing situation more quickly. Because the initial cost of constructing a core house is lower, the choice of this form also allows for housing to be provided to more beneficiaries sooner. Expandable core housing had been used in Indonesia for decades, since the 1970s as part of low-income housing programs.

2.5 Core Houses in Reconstruction in Central Java

In housing reconstruction after the Central Java Earthquake, core housing strategies and principles that support core housing (an initial minimal house, cash and materials dispersed in phases, potential for expandability) were used by a number of projects and in a number of ways. International humanitarian organizations provided core housing along with transitional housing. The transitional housing strategy proposed by the Shelter Sector forum in Yogyakarta included several variations, such as a 'Seed House' with reusable materials, a 'Combined Shelter Workplace' for home-based businesses, and a 'Starter House;' the core house is included in this last category of 'Starter House,' which can be expanded over time. 2400 core houses were provided as part of the transitional shelter program. JRF also provided core houses as part of their housing reconstruction.[12)] These core houses were built with a variety of sizes and shapes. In practice, many were not built specifically for expansion, but they all represent initial, stable and minimal houses. The official housing reconstruction process, distributed through a community-based system using the *pokmas* groups, was not specifically a core house scheme. However, the cash based system (cash was distributed to the community groups), and building materials (distributed to the individual homeowners) supported incremental construction.

2.6 The Core Houses in this Case Study

The two core house cases studies in this paper are examples of housing reconstruction projects that were implemented alongside the official government housing reconstruction. Both of these case studies relied on unique external funding sources, and both cases show how the core house, in these specific examples, can be combined with the official housing reconstruction process. They also show aspects that affect the relative success of the implementation of the core house, measured by the ability to expand.

In these two cases the timing and source of funds for the core house construction had a significant impact on the degree to which they could be integrated with the overall reconstruction process. The first case shows how the core

house was used to give the residents additional support, which could then be leveraged with the subsequent government support. The 2nd case shows how the core house can be part of a housing reconstruction that addresses gaps in beneficiaries left out of the official housing reconstruction.

In their original form, the core houses in these two cases were 3 meters by 6 meters (18 square meters), made up of two 3m x 3m modules. The structural frame is made of reinforced concrete columns spaced at 3 meter intervals, and is designed for expansion. **Figure 1** shows the expansion plan of the core house, as designed by Ikaputra. The initial construction, 3 by 6 meters, includes a living room (3m x3m) and a bedroom (3m x3m), and is shaded in dark grey. **Figure 2** shows the construction process, as designed by Ikaputra.

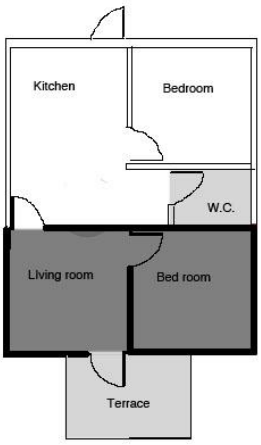

Fig. 1. Expansion plan of the core house design used in these 2 case studies, based on the plan by Ikaputra. The dark gray area denotes the initial 3 x 6 meter core house.

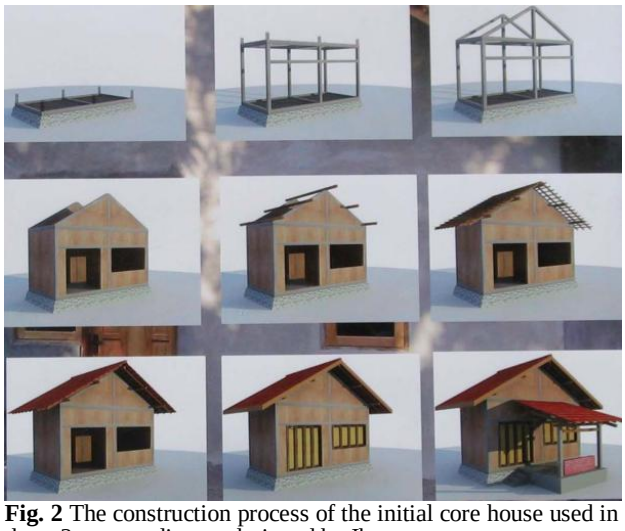

Fig. 2 The construction process of the initial core house used in these 2 case studies, as designed by Ikaputra.

3. Methodology

3.1 Research Object

This study focuses on the use of the expandable core house, a specific housing reconstruction form used in different villages in the disaster area after the Central Java Earthquake. The two specific cases that are considered are 2 villages in the southern part of Yogyakarta City, Kasongan and *Dusun* Tlogo, *Desa* Kebon Agung, *Kecamatan* Imogiri.

1) Kasongan

In the case of Kasongan, where a separate funding source supported core house construction before the main reconstruction funding from the government was available, residents were able to build the core house first, reuse many of the materials from their damaged houses (saving on construction costs) and subsequently expand or improve the core house using government support. **Figure 3** shows an example of a core house in Kasongan that had already been expanded.

Figure 3 A core house in Kasongan after expansion.

2) Tlogo, Kebon Agung

In the 2nd case, Tlogo village in Kebon Agung, the support for the core houses came later, after the official reconstruction process, and it was more difficult to physically integrate them into residential lots with other rebuilt structures in a way that allowed for their expansion.

3.2. Research Method

This study used both qualitative and quantitative methods, through surveys and interviews with residents, direct visual observation, documentation and measurement. The interview surveys were carried out in Kasongan village in September of 2009, 3 years after the earthquake, and in Tlogo in Kebon Agung in February 2010. A questionnaire survey was used as a base for structured interviews with respondents. The survey covered their housing situation following the earthquake until the present, and specifically focused on the living environment and expansion of the core house.

4. Case 1: Kasongan

Kasongan is a historic ceramic village and most residents' livelihood depends on some part of the ceramic production. Housing damage was compounded by the damage to pottery kilns and livelihoods. According to the priorities expressed by the residents, activities supporting livelihood recovery were carried out along with and in some cases before housing recovery.

The authors conducted a survey in Kasongan in September 2009, 3 years after the earthquake. The survey respondents lived in a part of the village which had received core houses as part of thier permanent housing reconstruction process. The funding for core house construction in Kasongan was provided by the government of Bengkulu, another region which had previously experienced disaster. This unique and very timely funding source allowed residents to leverage the official government support for reconstruction toward expanding the core houses in most cases.

Fig. 4 shows an example of 2 core houses that were built next door to each other, for relatives, and subsequently expanded with *pokmas* funding. **Fig. 5** shows the different forms and expansion patterns of the core houses in Kasongan.

Interviews were conducted with 18 residents. Most had lived in their house for many years, often for their whole lives. All respondents had owned their own home before the earthquake, and in many cases they had inherited these houses from their parents.

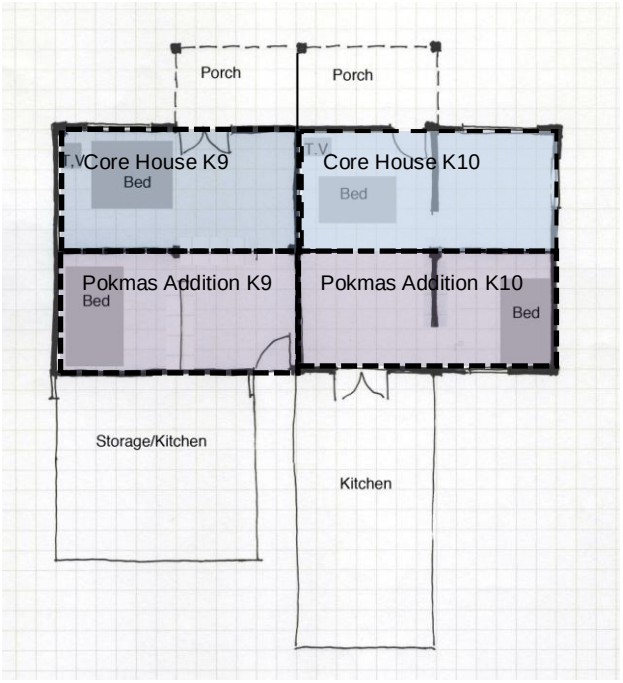

Fig. 4. An example of 2 core houses in Kasongan that were expanded with subsequent *pokmas* funding from the government reconstruction.

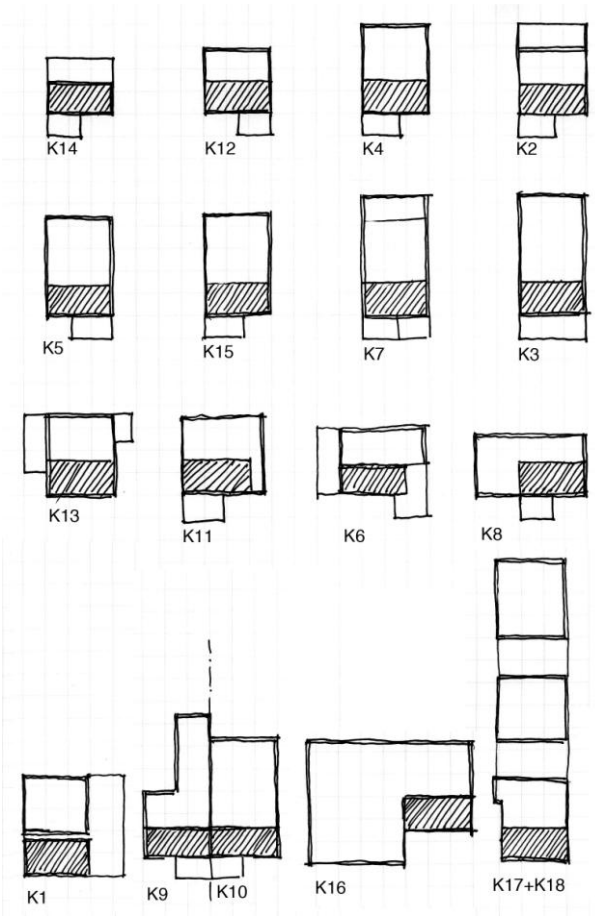

Fig. 5 Diagram of different patterns of expansion. The original 3 x 6 meter core houses are shaded.

4.1. Emergency Shelter and Temporary Housing

Immediately after the earthquake, most people stayed in a tent for a period of time, the shortest was for 4 months, and one respondent stayed in a tent for 1 year. Most people stayed in private family tents, and some stayed in larger multi-family or barracks tents. Those who stayed in the barracks tents tended to stay there for a shorter time, and then moved to another accommodation (private tent, temporary house) before finally moving in the core house. Some residents also stayed in other structures temporarily, such as a cowshed, pottery workshop, bamboo house, or in the houses of extended families.

Several households stayed in temporary housing between the time that they stayed in the tents and before moving into the core house. The time spent in temporary housing was relatively short, between 2-5 months was reported, compared to the length of time spent in tents. The time in temporary housing was also relatively small as a fraction to the total time between the earthquake and moving into permanent housing, as seen in **Fig. 6.** The respondents who stayed temporarily in another person's house stayed in this situation much longer than those in other temporary housing situations, for over a year or more.

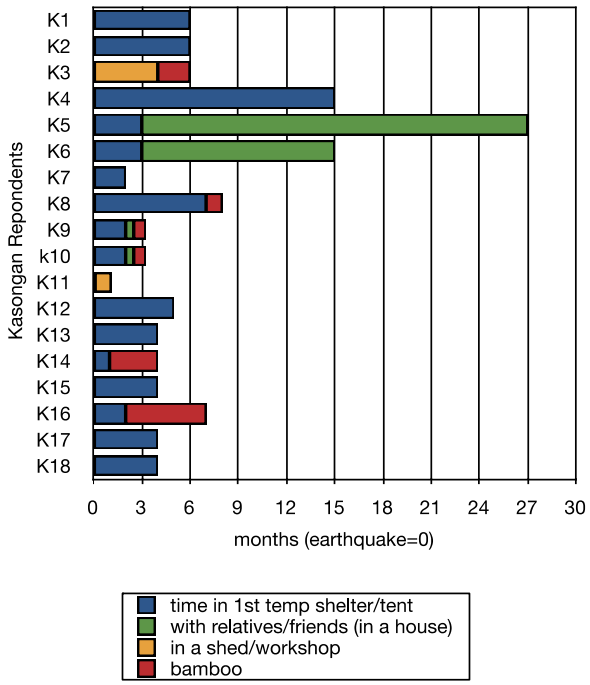

Fig. 6 Kasongan residents' time living in temporary housing

4.2 Core House

Of the 18 families interviewed, 8 had moved into their core house four months after the earthquake, and another 5 had moved in 7 months after the earthquake. By September 2007, (16 months after the earthquake) 14 of the households had moved into their core house. Of the remaining households, 1 moved in later, in August 2008, and 2 did not remember when they moved into their core house.

The construction time for the core house ranged between 3 weeks to 3 months. All the respondents received some help for building the core house, from neighbors or workers, and in some cases both. Many of the workers were provided by the neighborhood organizer of the core house project in Kasongan, who was an individual who had personal connections to the donor. Most residents reported that they had received technical assistance or advice from this person, or from students or teachers of the local Gajah Mada University. Many residents did not know how much the core house itself had cost to build, but had paid for building components (bricks, windows, roof tiles) or had reused materials from their old houses. As part of their financial contribution to the construction cost, residents often provided lunch for the workers. About 1/3 of residents

received help building from their neighbors. The rest had used workers; half of the respondents said these workers were provided by the neighborhood organizer.

4.3 Expanding the Core House

A previous survey by Ikaputra shows that most residents had expanded their core houses—97% in Kasongan-- within 1 year.[13)] From to the authors' survey, one resident who reported not having any income had only built a bamboo extension to their core house. All other residents had expanded their core houses with permanent construction. Residents gave different answers to what was expanded (toilet, spaces for religious functions, additional rooms, family room, living room, bedroom, and pottery spaces). In explaining their reason for expanding, 5 mentioned the need for more space, and 4 gave the reason that they had received money from the government.

Figure 7 shows the source of funds that residents used for construction and expansion of the core houses. Of those who expanded their core house, 2 had used their own funds or savings, and 2 had used a combination of their own funds and government funds. The rest used the government reconstruction funds, distributed through the *pokmas* community groups. Those who used their own money spent 1 million Rupiah (109 USD at current exchange rates) on the expansion. 13 of the households who used *pokmas* funding for expansion had used 15,000,000 Rupiah--the maximum government benefit in this area. Several of the households who used *pokmas* money to do the expansion had used less than the maximum amount—1 spend 2 million rupiah, 1 spent 4 million rupiah, and 1 did not report an amount. The expansions (including the 1 bamboo expansion) that were self-financed were also self-built. All the expansions that were financed by *pokmas* money were carried out by hired workers. After expansion, most houses were between 60 and 80 square meters.

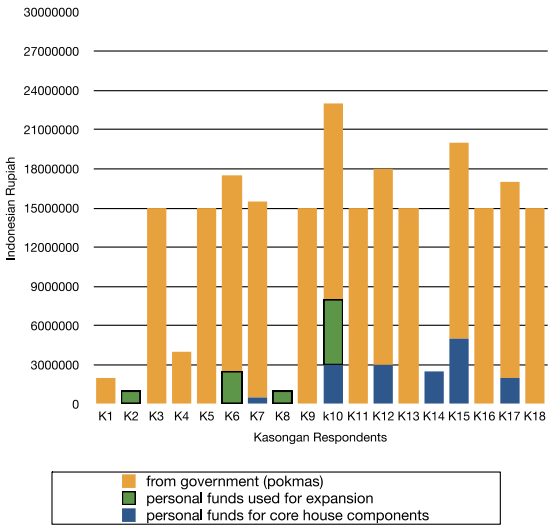

Fig. 7 Amount (in Indonesian Rupiah) and source of funds used for construction and expansion of the core house in Kasongan,

4.4 Timeline of Expansion

In one self-financed case expansion started right after the core house was constructed; the other self-financed expansion started 2 month after. Including these 2 cases, a total of 9 households had started expansion within 2 months after the core house was built. 2 more started expansion within 6 months, and 1 a year after the core house was complete. The fact that so many respondents started expansion soon after the core house was built shows that they had a strong desire to expand or improve their core houses, and that in most cases the money they received through *pokmas* could be used for expansion soon after the core houses were built.

4.5 Resident Satisfaction and Housing Suitability

1) Residents Opinion

The residents reported a number of things that they liked about their new houses. All said it had a strong structures; half mentioned good natural light. Having a bathroom or good facilities, or being new and clean, were also mentioned. Comparing their former (pre-earthquake) house to their current house, many said that their former house was bigger, but the current house is better because of the strong structure. Some preferred the former house, and some were equally satisfied with the former and current house. Most respondents were satisfied with their current house.

2) Residents' Satisfaction

Although individual respondents gave different answers to questions about how satisfied they were with life before and after the earthquake, overall, the level of satisfaction is the same before and after. In addition, the level of satisfaction is quite high. Taking this into consideration, whereas the respondents reported by 'satisfied' with their houses, it's still important to consider what problems or challenges the core house might pose for the residents that might not be readily apparent.

3) Suitability of the Core house

Before the earthquake, extended families tended to live in large traditional Javanese houses, passed down from parents to children. Because of the cost it was not possible to rebuild these houses after the earthquake. In this context, the core house was a way to quickly provide permanent housing to many beneficiaries, although it is a new unfamiliar form, and in almost all cases much smaller than previous houses, even after expansion.

5. Case 2: Kebon Agung

In the village of Tlogo in Kebon Agung, there were 3 sources of support for housing reconstruction: *pokmas* (government funded); Total (corporate social responsibility funding) and JRF (Java Reconstruction Fund, funded by international government donations). Expandable core houses (funded by Total) were introduced after other reconstruction projects (funded by *pokmas*) had already started. It was therefore often difficult to situate the core house on the site in a way that allowed for expansion. In addition, since more time had passed, it was no longer possible for residents to reuse building materials from their damaged houses in the construction of the core houses as had been the case in Kasongan.

The survey was carried out in 2010 in Tlogo, a village area in Kebon Agung. The 10 respondents interviewed had received different support during the housing recovery process: 3 had received support from Total to build an expandable core house (1 of the Total recipients also received *pokmas* funding) and 1 was a beneficiary of the JRF reconstruction program. The others had received *pokmas* funding only. In addition to the interviews and questionnaire surveys, a visual survey and documentation of Tlogo showed that even 5 years after the earthquake, there were still many examples of core houses that had not been expanded and remained in their initial form, a minimal 3 by 6 meters, as in **Fig. 8**. This shows that the core house requires integration into the recovery process, both in terms of timing and funding, to be successful.

Fig. 8. An unexpanded core house in Tlogo, Kebon Agung

The multiple sources of donations also resulted in various combinations of houses used by extended families, such as the 3 houses seen in **Figures 9, 10, and 11** that are the post-disaster housing for one extended 3-generation family**. Figure 9** is a house built with *pokmas* funding from the government, **Figure 10** is a temporary bamboo house, and **Figure 11** is a core house built with Total funding.

Figure 9. House built with *pokmas* funding

Figure 10. Temporary bamboo house

Figure 11. Core house built with funding from Total Indonesia

5.1 Temporary shelter

All respondents in Tlogo lived in a tent immediately after the earthquake, for time periods ranging from several days to 2 years. The tents were provided by a variety of sources: government, private company, non-profits, neighbors, and residents themselves. Before moving into permanent housing, half (5 out of 10) respondents lived in temporary houses made of bamboo, support for which was also provided by various sources, such as government, international, non-profit, and charity organizations, and neighbors. In addition, 2 of the respondents constructed their own self-built housing, using various materials including those salvaged from their former house. **Figure 12** shows that length of time that the Tlogo residents living in different types of temporary housing.

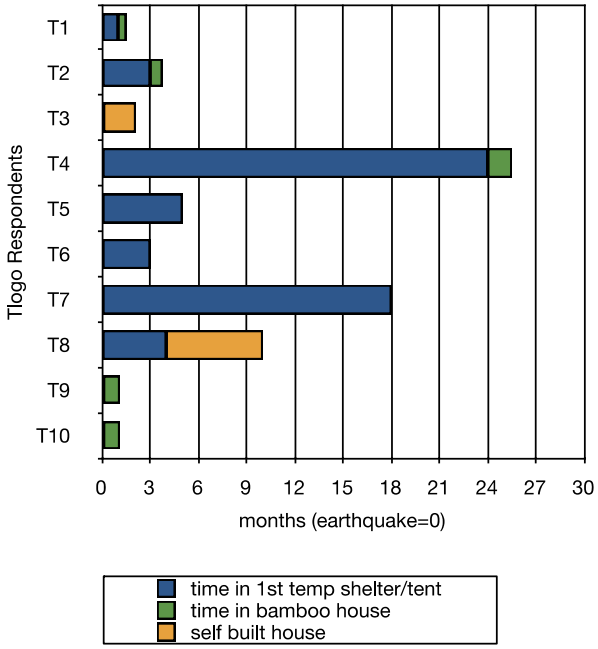

Figure 12 Time in temporary housing-Tlogo

5.2 Permanent Housing and the Core House

Compared to Kasongan, Tlogo residents were more aware of the cost of their permanent house construction, and they also were more likely to have contributed their own funds for this construction. **Figure 13** shows the cost and source of funds for construction and expansion of Tlogo residents' houses. 5 of the respondents had moved into their current house in 2006, 4 more in 2007 and 1 in 2009 (although their house was completed in 2008). In comparison, most Kasongan residents had moved into the core house in 2006, although some moved in later.

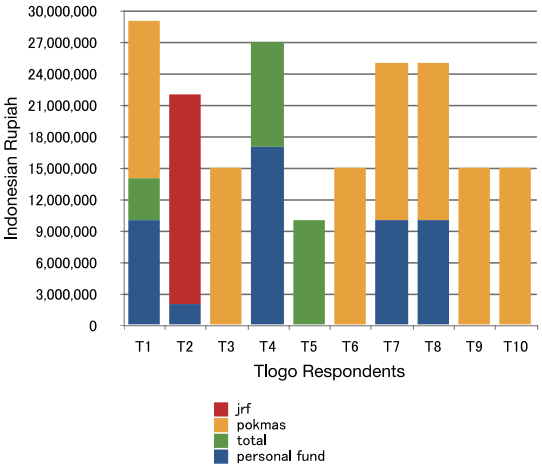

Figure 13. Cost and source funds for core house construction and expansion in Tlogo

5.3 Expansion

Of the 10 respondents, 7 had expanded or improved their original permanent house. Of the 3 who had received support from Total, the family that received support from both *pokmas* and Total had used the money from Total to improve the

finishes on the house. Of the other 2 Total beneficiaries (who did not receive support from other sources), 1 had expanded their house 1 year later, and 1 had not expanded. The other households who had not expanded had received support from JRF and *pokmas*, respectively. Overall, Tlogo residents who expanded their houses did so later than those in Kasongan. In Tlogo, 1 household started expansion immediately, but others started expansion or upgrading 1 or more years later.

5.4 Satisfaction

Similar to Kasongan, most residents in the Tlogo identified the strong structure of their new house with the size, infrastructure, light, and facilities identified by 1-3 respondents each. Many answered that their former house was bigger, and in some cases better or more finished. Several respondents said the new house was better because it was stronger and more permanent. More than half said they were satisfied or very satisfied with their new house.

6. Analysis

The core house itself can offer a useful and beneficial housing option for residents in terms of a safe, sturdy, and livable habitation, minimal at first, but able to be expanded over time. As a small house, the cost of initial core house construction is lower, saving money for individuals doing the construction, and as a program allows for broader coverage and allows more residents to benefit from the program.

The incremental nature of the core house expansion puts control of the house in the hands of the residents themselves, so they can chose the way they want to expand their houses, based on their own priorities for additional space, and at the time when they are able to accomplish it, financially. In the case of Kasongan, which is a pottery village, this use of the core house had an added benefit that the residents could balance their priorities for their own livelihood and housing recovery, and invest their money as they choose.

Core houses were used in various ways throughout the reconstruction process; the two case studies in this paper deal specifically with core houses that were built with special outside funding and supplemented the main reconstruction process. In the case of Kasongan, early funding for the core house construction allowed the core houses to be smoothly integrated into the overall housing recovery process. The initial construction of the core houses was already complete when the government funding because available, allowing residents to use the money to expand their houses. Because of the outside support for the core houses, Kasongan residents didn't have to spend as much on the construction of the core house, or on the expansion. Because of the early timing when the core houses were constructed, the design and location on the site allowed for the eventual expansion of the core houses.

In Tlogo, the core houses were provided through a corporate donation from Total Indonesia oil company, which provided housing for those who had not qualified for the official housing benefits. Core houses in Tlogo were also a supplement to the official housing project. In this case, the core house was introduced after the official housing reconstruction process had already started, and mainly targeted beneficiaries who had been left out of this main reconstruction process, which was only provided to the registered head of the family. In the case of a multi-generation or extended family living together in one house before the earthquake, the reconstruction program only provided for one beneficiary family to rebuild one house—which is often not big enough to accommodate adult children and their families. This creates a beneficiary gap, as some families (especially adult children and their young families) can't receive a house. In both of the case studies, the core house projects' funding from an independent source meant that distribution was not restricted by formal registration. Housing materials were distributed based on community consensus, and did not need to be limited by official family registration.

Whereas in both cases, residents could benefit from receiving support in the form of the core house, in the case of Kasongan, more residents were able to expand their houses, while in Tlogo many core houses remained in their initial minimal form. Considering this aspect, the core house may not be the best form for reconstruction housing for all beneficiaries or the most vulnerable, because it requires participation by the residents to upgrade it to archive a higher living standard. In both cases, one benefit of the low cost of the core house is that it allowed more beneficiaries to receive houses. In this aspect, because of it's affordability, the core house can be seen as a general strategy to reduce gaps in housing beneficiaries.

7. Conclusion

The core house concept can provide flexibility to both residents and housing providers. The two case studies show different ways that core houses could compliment the official housing reconstruction process, facilitating expansion when implemented early, or covering housing beneficiaries who had been left out of the process.

Core houses allow residents to be involved in the design and construction, and in choices about how and when to expand. The incremental aspect of the expansion puts control in the hands of the residents, as they can decide their own priorities for expansion and/or upgrading in the context of their other goals for their lives and livelihoods.

Although the case studies demonstrate the flexibility of core house, their implementation shows different outcomes and varying success, specifically in terms of the ability of the residents to expand the core houses. The core house requires coordinated implementation within the larger context of housing reconstruction, especially in terms of funding and timing. The core house on its own does not guarantee successful housing reconstruction, but it can play a useful role as part of comprehensive strategy for recovery after disaster.

References

1) Nizam. (2006). "The Role of Universities in Recovery Programs." *Recovery Status Report: The Yogyakarta and Central Java Earthquake.* In International Recovery Platform: 2006, p. 88.
2) Ikaputra (2012). "Synergy For House Reconstruction of Post-Earthquake A Case Study of Java Post-Earthquake 2006." *J. Appl. Environ. Biol. Sci.*, 2(1) 28-34, 2012.
3) Roychansyah, Muhammad Sani (2010), Recovery Status Report #1 The Yogyakarta and Central Java Earthquake 2006 (Thematic Recovery Frameworks and Current Status of Recovery Efforts on Shelter), International Recovery Platform, Kobe, pp. 7-15.
4) International Recovery Platform (2010). Recovery Status Report: The Yogyakarta and Central Java Earthquake 2006.
5) Manfield, Pete. (2007). "Early Recovery from Java Earthquake 2006/7." Jakarta: UN Humanitarian Coordinator/Resident Coordinator's Office.
6) International Recovery Platform (2010). Recovery Status Report: The Yogyakarta and Central Java Earthquake 2006.
7) Roychansyah, Muhammad Sani (2010).
8) Roychansyah, Muhammad Sani (2010).
9) Roychansyah, Muhammad Sani (2010).
10) Early Recovery Cluster/Emergency Shelter Cluster, (2006) Transitional Shelter/Rumah Cikal Strategic Framework, *https://www.sheltercluster.org/.../4.3.2.2%20T-...*accessed 9.20, 2012.
11) REKOMPAK (2012). Rebuilding Indonesia's Communities After Disasters. Jakarta: World Bank. 2012.
12) Ikaputra (2008). Core House: A Structural Expandability for Living: Study Case of Yogyakarta Post Earthquake 2006. *Dimensi Teknik Arsitektur* vol. 1. no. 1. July 2008: 10-19. 2008.
13) Ikaputra (2008).