Construction Systems for Extensions and Renovations in a Resettlement Site in the Philippines

Tsuyoshi Seike1*, Yumi Shoji2, Yuki Takemura3, Yusuke Kunie4, Rizalito M. Mercado5 and Yongsun Kim6

1 Associate Professor, Dr. Eng., Graduate School of Frontier Sciences, The University of Tokyo, Japan
2 Master's Course, Graduate School of Frontier Science, The University of Tokyo, Japan
3 Doctoral Course, Graduate School of Frontier Science, The University of Tokyo, Japan
4 Master's Course, Institute of Industrial Science, The University of Tokyo, Japan
5 Assistant Professor, Ph.D., College of Architecture, University of Santo Tomas, Philippines
6 Researcher, Dr. Eng., Graduate School of Frontier Sciences, The University of Tokyo, Japan

Abstract

In Manila, the Philippines, resettlement projects have been implemented to relocate informal settler families from slums and disaster-prone metro areas. At resettlement sites, housing units are often provided to beneficiaries, who then extend and renovate them. Such extensions and renovations of housing, and the processes involved, are considered to have a significant impact on living environments and local communities; however, these impacts are not yet fully understood. Thus, this paper investigates the following elements at St. Martha Estate, one of the resettlement sites: A) the condition of housing that has undergone extension and renovation, B) the construction systems used for these extensions and renovations, and C) the attributes of the residents. Subsequently, correlations among A, B, and C were analyzed to gain knowledge that can improve the living environment. First, we examined A by conducting a photographic survey of the houses’ exteriors and interiors. Then, B and C were examined through interviews with the residents. Through analysis of correlations between A, B, and C, it was found that the characteristics of the builders of the extensions and renovations were related to the construction skill and the economic conditions of the residents, which in turn affected the condition of the extensions.

Keywords: construction system; extension and renovation of housing; relocation site; low-income residence; Philippines

1. Introduction

1.1 Background and Purpose

As of 2014, approximately 40% of the Philippines’ urban population were living in slums with poor living environments (UNdata, 2014). Consequently, the Philippines’ government has been implementing resettlement projects to relocate informal settler families (ISFs). At these resettlement sites, the government often provides housing lots and units to the beneficiaries. Residents then extend and renovate the houses by themselves after moving in. On the one hand, the residents’ extension and renovation of housing enables them to directly realize their priorities regarding their living environments and allows for the creation of active communities through cooperative works among neighbors. On the other hand, however, there are fears that these sites could transform into poor living environments, like slums, through accumulations of low-quality construction performed by poorly skilled residents.

Previous surveys have already investigated the condition of the extended/renovated housing and the attributes of residents at several resettlement sites in the Philippines (Carrasco et al., 2016a). However, the construction systems used for extensions and renovations (i.e., the manner by which people at resettlement sites conduct the extension and renovation of their housing) are not yet fully understood, nor is their influence on the condition of housing and the lives of the residents.

Considering this, the purpose of this study is to investigate the following three elements at St. Martha Estate, a recently created resettlement site in the Philippines: A) the condition of the housing that has been extended and/or renovated by residents, B) the construction systems used for such extension and renovation, and C) the attributes of the residents. Subsequently, correlations between A, B, and C are analyzed in order to explore 1) the influences of the construction systems on the condition of the housing, and 2) the relationship between the residents’ attributes and the construction systems. We believe that this
study will contribute to future consideration of how the living standard in St. Martha Estate could be improved.

1.2 Previous Studies

There have been several previous studies on resettlement sites. Miguel Gb Ibarra et al. (2003) investigated the residential-environment-related needs of residents who live in slums and resettlement areas, and ranked residence-environment elements in terms of priorities. Specifically, the order was: ownership of a house, proximity to the city center, infrastructure, transportation, residence type, and public facilities. Meanwhile, Santos-Delgado (2009) examined the possibility of the implementation of self-help housing through the low-cost housing projects being conducted in Davao City, the Philippines. Case studies on self-help housing have determined that low-cost house construction facilitates the strengthening of community relationships and the realization of self-value.

Focusing on extensions and renovations, Jorge (1982) mentioned that in the resettlement areas of the Philippines these works are largely implemented by residents. By targeting houses in resettlement areas where Freedom to Build had been awarded, the characteristics of the residents and the development processes were identified. The reasons behind the residents’ implementation of extensions and renovations include the fact that many have a small income, and most want to run a store; by extending their houses they can facilitate a Filipino traditional outdoor kitchen called a "Dirty Kitchen." (Carrasco et al., 2016a) Considering the residence-environment-related requests of the residents, such extensions are inevitable, and it can be concluded that the provision of appropriate houses and the establishment of resolutions that fit regional characteristics are necessary. (Carrasco et al., 2016b) However, there are also dangers associated with these extensions and renovations, as the materials used can have poor durability. Nevertheless, the use of better quality materials is gradually increasing, and high-quality extensions and renovations can be implemented if financial and technical support from NGOs or regional governments are present.

Additionally, considering situations overseas, studies have been performed on non-engineered housing construction in Jakarta (Watanabe, 2013) and informal housing supply mechanisms in Bangkok (Tamura, 2012).

Therefore, there have been many studies on the residence-environment-related needs of low-income individuals, as well as actual investigations of extensions and renovations. However, few studies have mentioned the attributes of the residents who execute such extensions and renovations and the construction systems employed. Thus, a unique aspect of this study is that it studies the attributes of such residents and construction systems by focusing on the conditions of houses that have undergone extension and renovation.

2. Methods

As the first step of this research, we conducted interviews with an engineer from the Bulacan office of the National Housing Authority (NHA) and an architectural engineer from the Bocaue municipality in order to obtain an outline of the St. Martha Estate Homes project (section 2). Second, we visited St. Martha Estate and conducted three types of survey to better understand the housing conditions, the construction systems used for extensions and renovations, and the residents’ attributes. First, we took exterior photographs of 951 houses (section 3). Second, we conducted a survey of the interiors of 60 selected houses. Finally, we interviewed the residents of the above 60 houses (sections 3 and 4). All surveys were conducted in August and October, 2016.

Since the residents of St. Martha Estate mainly speak Tagalog, we asked interpreters to translate English/Tagalog into Tagalog/English during the surveys. The interpreters included St. Martha Estate residents who were fluent in English, as well as college students and social workers living in Metro-Manila.

3. Condition of Houses with Extensions and Renovations

3.1 Overview of St. Martha Estate

Based on the interviews with the NHA engineer and the architectural engineer, an overview of St. Martha Estate was developed, and is summarized below.

The study area, St. Martha Estate, is a suburban resettlement site located in Batia, Bocaue, Bulacan, approximately 30 km north of Metro-Manila. ISFs from the Metro-Manila area have been moving to the site since 2013. As of August 2016, 3,316 rows of houses had been built on an approximately 19-hectare area of St. Martha Estate (Fig.1.). The NHA initiated and supervised the project, while a private development company, Baque Corporation, conducted land development and house construction.

In the project, the NHA provided lands and standard housing units to beneficiaries. There are two types of housing unit: single-story units (961 units) and loftable units (2,355 units) (Fig.2.). Moreover, the area is divided into four parts, based on construction phase (Fig.1.). The single-story units were built in Phase 1a, the earliest phase, when the project had a lower budget. Meanwhile, Phase 1b, Phase 2, and Phase 3 all feature loftable units. Fig.3. shows the plan and Fig.4. shows the internal appearance of some single-story units that were extended and renovated.

Regarding regulation to renovate and extend the original housing units, the homeowners are required to ask the architectural engineer of Bocaue municipality for building permission. However, at the time of our interview, only approximately 20 cases in the St. Martha Estate had been submitted to the engineer. In addition, the engineer does not regularly inspect the
Therefore, it can be considered that most of the extensions and renovations are conducted without proper adherence to building codes.

3.2 Overview of the Survey
We conducted surveys of the exteriors and interiors of houses in St. Martha Estate in order to grasp the condition of houses that had been extended and renovated by residents. The analysis items are listed in Table 1.

First, we photographed the exteriors of 951 houses, which were single-story units built during Phase 1a, from the streets adjacent to the houses. From the data collected, we analyzed how the houses had been extended and renovated, focusing on the building materials and the directions of the extensions.

Secondly, we selected 60 houses from Phase 1a and conducted a survey of their interiors, interviewing an inhabitant from each house in order to investigate the details of the extensions and renovations. In particular, we conducted research on the spatial structures of the extensions, building materials used for the extensions and renovations, methods of interior renovation, and reasons for specific extensions and renovations.

Table 1. Research Methods and Analysis Items

| Object          | Research method                  | Analysis items                        |
|-----------------|----------------------------------|---------------------------------------|
| 951 houses      | Photographing exterior           | Extension                             |
|                 |                                  | Original housing unit                  |
|                 |                                  | Front | Back |
| Spatial structure | - | - |
| Wall             | - | - |
| Roof             | - | - |
| Window           | - | - |
| Floor            | - | - |
| Finish           | - | - |
| 60 houses        | Photographing interior/ drawing the housing plan | Spatial structure |
| Spatial structure | Spatial structure | Partition |
| Wall             | Wall | Original wall |
| Roof             | Roof | Ceiling |
| Window           | Window | Loft |
| Floor            | Floor | Original floor |
| Finish           | Finish | - |
| Interviewing inhabitants | First extension/renovation of house and reason for such work | Future plan for extending/renovating house and the purpose of such work |

3.3 Analysis of Extensions Using Exterior Photographs of 951 Houses
The houses were extended in three different directions; this is shown in Fig.2. using X, Y, and Z. X is an axis that is orthogonal to the street in front of the houses, Y is an axis that is parallel to the street, and Z is an axis that is vertical to both the X and Y directions.

Houses with extensions along the X axis (in other words, houses with extensions to the front and/or back of the original housing units) were the most common. Of the 951 houses, 741 houses had extensions in front of the original housing units.

Spatial structures of extensions in front of the houses were divided into three types (Fig.5.): 1) the indoor type, in which an extended roof and an extended wall intersect and create indoor spaces; 2) the semi-indoor type, which has a gap between an extended roof and an extended wall or consists of either an extended roof or wall; and 3) the outdoor type, which has neither an extended roof nor an extended wall. Among the 951 houses, the most common type was the "indoor type," with over half (490 houses) coming under this category. Meanwhile, 251 houses were "semi-indoor type" extensions and 210 houses were "outdoor type."

Focusing on extensions along the Y axis, the houses can be roughly divided into two types: 1) joint type (Fig.6.-A, 16 houses), in which extensions are joined to adjacent houses, and 2) single type, in which the
A small number of houses (40 houses) in corner lots had extensions on the side (Fig.6.-E). Further, a small number had extensions to add second stories and lofts along the Z axis (Fig.6.-E, two houses).

Regarding building materials used in the front extensions, extended walls were made of a variety of materials such as CHBs finished with mortar and paint (Fig.6.-A), wood, cloth, and metal plates (Figs.6.-B and C). CHBs were the most commonly used building materials for walls, being used in approximately 60% (425 houses) of the 741 houses with front extensions.

Regarding building materials for extended roofs, approximately 70% (509 houses) of the 741 houses with front extensions used tin. As for combinations of building materials for extended walls and roofs, the use of CHBs for walls and tin for roofs was the most common, with 333 of the 741 houses with front extensions using this combination. Thus, this combination can be considered a typical building style for extensions and renovations of houses in St. Martha Estate.

Among the 60 houses, the most commonly used building materials were CHBs for the walls and tin for the roofs. Further, 40 houses used CHBs for the extended walls, and 46 houses used tin for the extended roofs. Wood and vinyl sheets were also common and used for all parts of the extensions; 22 houses used wood and 38 used vinyl sheets for their extensions.

In particular, "indoor type" extensions tended to use CHBs for the walls and tin for the roof. Of the 39 houses with indoor-type front extensions, 29 used this combination, and of the 39 houses with indoor-type back extensions, 25 used this combination.

For windows in the indoor-type extensions, the most commonly used building materials differed for front and back extensions. For the front extensions, metal materials such as iron grills were the most commonly used. Of the 39 houses with the indoor-type front extensions, 25 houses used metal materials for their front windows. Meanwhile, for the back extensions, of the 39 houses with indoor-type back extensions, 22 had no windows (Fig.7.-C) Thus, it can be considered that the residents did not pay much attention to the sanitation of their houses, such as in regard to ventilation and daylight.

Typical methods of renovating the interiors of the original housing units included applying finishing to the walls or floors, partitioning a room with a curtain or plywood, and installing a ceiling or loft. Of the 60 houses surveyed, in 38 paint had been applied to the walls, and in 40 either tiles or vinyl sheets had been applied to the floor as finishing (Fig.7.-D). Moreover, most of the residents (46 of the 60 houses) had partitioned the inside room of the original housing unit into several small rooms; of these, 38 used curtains or furniture for partitions, with the rest using plywood (Fig.7.-E). On the other hand, only eight houses had installed a new ceiling (Fig.7.-F) and five houses had loft space.

3.4 Analysis of Extensions and Renovations Based on Interviews and Interior Surveys of 60 Houses

Using the data collected from the survey of the interiors of 60 houses, the spatial structures of extensions, building materials used for extensions and renovations, and methods of interior renovation were analyzed. Subsequently, four general types of extension and renovation conditions were clarified. In addition, the priorities of the residents regarding their living environments were analyzed based on the results of interviews with the inhabitants.
renovating the interior of the original housing units. Table 2. shows the four most common combinations of the extensions and renovations in the 60 houses.

Finally, in order to determine the residents' priorities regarding their living environments, their answers to the following two questions were analyzed: "What was the first extension/renovation you made to your house after you moved in and why did you do it?" and "What are your future plans for extensions and renovations of your house and what is the purpose of this work?"

For the first question, the most frequently mentioned reason was extending the houses along the X axis in order to acquire a bigger and/or safer living space (30 of the 60). The second most common reason was to apply vinyl sheets on the floor or to paint the wall in order to improve the rough surfaces of the existing walls and floors (14 of the 60).

From the answers to the second question, it was found that most of the inhabitants needed further living space and were planning another extension (20 of the 60). Plans to make a second floor or loft was a common answer to the second question (seven households)—more common here than for the first (one household). Thus, it is expected that the number of houses with extensions along the Z axis will increase in the future.

Table 2. Typical Combinations of the Extensions and Renovations

| Extension | Renovation | Materials | Windows | Method | Hours |
|-----------|------------|-----------|---------|--------|-------|
| (1) Both front and back are indoor | CHB and tin | Has a windowless room | CHB and tin | Finishing of walls and floor, partition | 11 |
| (2) Either front or back is indoor | CHB and tin | All rooms have windows | CHB and tin | Finishing of walls and floor, partition | 6 |
| (3) Either front or back is indoor | CHB and tin | All rooms have windows | CHB and tin | Ceiling and loft in addition to finishing | 5 |
| (4) Semi-indoor or outdoor | Wood and vinyl sheet | - | - | Finishing of walls and floor, partition | 6 |

Table 3. List of Interview Questions

| Topic | Question |
|-------|----------|
| Residents' attributes | Basic information | Status of ownership |
| | | Family size |
| | Economic condition | Monthly income of household |
| | | Cost of extending/renovating housing |
| | | Loan for extending/renovating housing |
| | Community | Current debt and debtor |
| | | Number of friends inside St. Martha |
| | | When inhabitants met friends, whether before or after relocation |
| | Awareness of living environment | Whether they are satisfied with the current local community |
| | | Whether they are hoping for permanent residence or plan to move |
| | Plan | Planner |
| | Construction systems for extensions and renovations | Builder |
| | Construction | Relationship between inhabitant and builder |
| | | Experience of working as professional construction worker |
| | | Experience of learning construction |
| | | Cost of hiring builders |
| | Materials procurement | Person who procured materials |
| | | Procurement method |
4.3 Analysis of Construction Systems

Based on the results of the interviews with the inhabitants, the characteristics of the planners and builders for the extension/renovation work performed on 59 houses, as well as the methods of material procurement, are described below. This number does not include one house, as the inhabitant did not know when the house was extended/renovated. Through the analysis, it was found that the typical construction systems for extensions and renovations could be described using four combinations of the three above parties. The planners of extensions and renovations were generally the inhabitants themselves (53 of the 59 houses).

On the other hand, the builders could be classified into six types by coupling two different systems of classification: (1) whether extension/renovation of the house was performed only by the inhabitants, by the inhabitants and others or by others only; and (2) whether the builders of the extension/renovation had professional construction experience or were inexperienced amateurs with no professional experience (Table 4.). Regarding the cost of hiring builders, it was found that the average cost was lower when the inhabitants constructed the extensions and renovations in collaboration with others with professional construction experience than when only others with professional experience worked on the construction. Using the data of 21 houses that could answer the cost of hiring builders,

In the case of the former, (seven houses) the cost of hiring builders was approximately 2,000 pesos (42 USD) on average, and for the latter (14 houses) it was approximately 5,600 pesos (118 USD) on average.

5. Correlations between Housing Condition, Construction Systems, and Residents' Attributes

In this section, correlations between the condition of the housing described in section 3, the attributes of the residents, and the construction systems for the extensions and renovations described in section 4, are analyzed.

First, the 59 houses/households were classified based on the six types of builders shown in Table 4. Then, using the data for 57 houses/households that satisfy types 1–4 listed below, the characteristics of the housing conditions and the attributes of the residents in each group were clarified by conducting comparative analysis between the groups.

5.1 Type 1: Builders were Inhabitants with Professional Construction Experience (12 Houses)

For Type 1, the average monthly income of the households was approximately 20,500 pesos (431 USD), higher than the 16,000 pesos (336 USD) average for the entire pool of households. This means possessing suitable construction skills and availing of opportunities to obtain jobs in construction would enable the residents of St. Martha Estate to earn a relatively high income.

For this group, the average expenditure on extensions and renovations was approximately 13,800 pesos (290 USD), approximately half of that of Type 4. On the other hand, the ratio of houses with indoor-type extensions made of CHBs and tin was approximately 70% (eight of 12 houses), which was close to that of Type 4 (approximately 80%). In addition, none of the houses in this group had installed a loft or ceiling and, thus, the expenditure on the extensions and renovations were lower; it can be considered that the inhabitants in this group saved costs by performing the construction themselves.

Regarding houses without indoor-type extensions made of CHBs and tin, although they mostly spent less than 3,000 pesos (63 USD) and used cheap wood, they
adopted construction methods that required skills such as assembling columns and beams.

Six of 11 houses with indoor-type extensions had windowless indoor-type extensions.

5.2 Type 2: Builders were Inhabitants without Professional Construction Experience (13 Houses)

For Type 2, the average monthly income of the 13 households in question (9,400 pesos/197 USD) and the average cost of extensions and renovations (4,200 pesos/88 USD) were less than those for any of the other types. Moreover, six of the 13 households had debts, and none were in a loan program with a reliable organization. This means that the households in this group lacked sufficient and stable incomes.

Ten of the 13 houses in this type did not have indoor-type extensions with a combination of CHBs for the walls and tin for the roofs. Instead, they had indoor-type extensions mainly made of wood and vinyl sheets and/or semi-indoor type extensions. The building materials used in these extensions were mainly cheap and low quality. Commonly used materials such as recycled wood, vinyl sheets, nets, and waste materials were purchased from stores cheaply, sourced from other persons free of charge, or sourced from elsewhere by the inhabitants themselves.

Four of eight houses with indoor-type extensions had windowless indoor-type extensions.

5.3 Type 3: Builders were Inhabitants and Others with Professional Construction Experience (10 Houses)

As mentioned in section 4, the average cost of hiring builders was less in cases where the construction work was conducted in collaboration with the inhabitants and others with professional experience than in cases where the construction was conducted only by others with professional experience. The average monthly income for Type 3 (11,100 pesos/233 USD) was approximately half of that of Type 4. The average expenditure on extensions and renovations for the former group (22,400 pesos/470 USD) was also less than that of Type 4, but it was higher than the overall average of 16,200 pesos (340 USD). Considering this result, it cannot be simply concluded that the members of this group collaborated in the construction because of insufficient funds to hire builders for the entire construction.

Regarding the condition of the housing, 7 of the 10 houses in this group had indoor-type extensions made of CHBs and tin. Moreover, out of nine houses overall that installed ceilings and/or lofts in the interior of original housing units, in addition to having indoor-type extensions made of CHBs and tin, eight houses were members of this group. In general, building extensions and renovations along the Z axis require builders with professional experience and skills as well as high-quality and durable materials. Therefore, it can be considered that the households in this group implemented such extensions and renovations because they had sufficient economic resources to afford qualified and durable materials and hire builders with professional experience.

Eleven of 21 houses with indoor-type extensions had windowless indoor-type extensions.

5.4 Type 4: Builders were Others with Professional Construction Experience (22 Houses)

The average monthly income for Type 4 households was higher than that for any other type (21,000 pesos/441 USD). The average cost of extensions and renovations was also higher than any other type (26,400 pesos/557 USD). Moreover, eight of the nine households were in a loan program with a reliable organization. This means the households in this group tended to have high and stable incomes.

Another influential factor in conducting collaborative construction was inhabitants' relationships with their community. However, the data collected in this survey were insufficient to warrant such analysis.

Regarding the condition of houses with this type of extension/renovation, seven of the 10 houses had indoor-type extensions made of CHBs and tin, while two of eight houses with indoor-type extensions had windowless indoor-type extensions.

5.5 Summary of the Correlations

Summarizing the findings listed above, the correlations between the residents' attributes, the construction systems, and the conditions of the housing shown below and in Fig.8. were interpreted.

When residents have professional construction experience, the residents themselves can perform the construction, and indoor-type extensions made of

| Attribute of the residents | Builder | Condition of extension | Condition of renovation inside the original unit |
|----------------------------|---------|------------------------|-----------------------------------------------|
| Residents with professional construction experience | Inhabitants | Indoor type extension with CHB and tin | Installing partition, and finishing to wall and/or floor |
| Residents without professional construction experience | Others with professional construction experience | Indoor type extension mostly made of wood and vinyl sheets or semi-indoor type extensions | Installing ceiling or loft in addition to the partition and finishing |
| | Inhabitants and others with professional construction experience | | |
| | Inhabitants | | |

Fig.8. Correlations between the Three Elements
CHBs and tin are often implemented. Moreover, the residents can earn a relatively high income through construction work.

Even if residents do not have professional construction experience, indoor-type extensions made of CHBs and tin are often realized in cases where the residents have sufficient economic resources to hire others with professional experience. The cost of hiring builders is lower when residents collaborate with others with professional construction experience than when they leave the entire construction job to others with professional experience. When residents do not have either professional construction experience, sufficient economic resources to hire builders with professional experience, or connections to collaborate with them, the residents themselves perform the building, with indoor-type extensions made of CHBs and tin being much less common among this group.

On the other hand, extensions without windows are often built, even if the builder has professional construction experience. This is thought to be due to insufficient awareness in the community of the importance of ventilation and daylight.

6. Conclusion

Through this research, the conditions of houses with extensions and renovations, the attributes of residents, the construction systems for extensions and renovations, and correlations between the three at St. Martha Estate were clarified.

Conditions of houses with extensions and renovations; Although a variety of extensions and renovations were observed, it was found that the most common extension was an indoor-type made using CHB and tin, and the most common renovation was applying finishing on the walls and floors of the original housing unit.

Residents' attributes; It was found that there were wide income gaps between the 60 households. Twelve of the 60 houses had been resold by the original beneficiaries, and the inhabitants of the resold houses tended to have higher incomes than the original beneficiaries. The average cost of extensions and renovations for the former was also higher than those implemented by the latter.

Construction systems for extensions and renovations; Planners of extensions and renovations were mainly the inhabitants themselves. On the other hand, external individuals were frequently involved in construction and material procurement. In particular, collaborative construction involving the inhabitants and others with professional construction experience reduced the cost of extending and renovating housing.

Correlations between the three above elements; It was considered that the presence or absence of residents' professional construction experience and residents' economic condition affected the involvement of builders with professional construction experience in construction processes. It was found that the likelihood of indoor-type extensions featuring CHBs and tin being built was higher in cases where the builders had professional construction experience. On the other hand, regardless of the professional experience of the builders, indoor-type extensions without windows were often built.

Based on these findings, we discussed whether both residents' acquisition of professional construction skills and collaborative construction have the potential to reduce the economic burden in relation to extending and renovating houses. Many inhabitants obtained construction materials from acquaintances for free, encouraging cooperation in both material procurement and construction, and this may also reduce economic burdens. However, how such cooperation occurs could not be revealed through this research. Thus, this topic must be further investigated.

Regarding the fact that windowless indoor-type extensions were often built, regardless of builders' professional construction experience, we discussed whether there was a need for both residents and builders to become aware of the importance of ventilation and daylight. However, how the people in St. Martha Estate acquire and share the knowledge to plan and build extensions and renovations must be further investigated.

Acknowledgements

The authors received generous support from NPO Kamal Freda, the University of Santo Tomas, the NHA, and interpreters. We would like to express our gratitude to all of the relevant parties.

References

1) UNdata, Number of urban population living in slums, Philippines, 2014.
2) Carrasco, S. et al. (2016a): A study on housing modification in resettlement sites in Cagayan de Oro, Philippines. Journal of Asian Architecture and Building Engineering, 15 (1), pp.25-32.
3) Miguel Gb Ibarra, J. et al. (2003): Stated residential preference of squatters and resettlers in Davao City, Philippines. Journal of Architecture and Planning, 68 (563), pp.117-124.
4) Santos-Delgado R. (2009): Adopting organized self-help housing approach in low-cost housing in Davao City, Philippines. A Journal of Architecture, Landscape Architecture and the Designed Environment, University of the Philippines College of Architecture, 3, pp.59-6.
5) Jorge, A. (1982): A study of relocation to Dasmarinas Bagong Bayan the suburban area from Manila. Journal of Architecture and Planning, 53, pp.329-332.
6) Carrasco, S. et al. (2016b): Impacts of resident-initiated housing modifications in resettlement sites in Cagayan de Oro, Philippines, International Journal of Disaster Risk Reduction, 17, pp.100-113.
7) Watanabe, S. et al. (2013): Research on non-engineered housing construction based on a field investigation in Jakarta, Journal of Asian Architecture and Building Engineering, 12 (1), pp.33-40.
8) Tamura, J. et al. (2012): A research on informal housing supply mechanism in sites and services areas: The case of 70 Rai District, Bangkok, Reports of the City Planning Institute of Japan, 10, pp.213-216.