How sustainable are the Philippines-based housing donor programs?
A multi-disciplinary perspective
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Abstract
This paper investigates the sustainability of the donors’ post-typhoon Durian housing programs located in the province of Albay, Philippines, assessed by national government as highest risk to natural disasters. Study deals with three areas, namely disaster risk management practice based from ISO 31000:2009 principles within each and among housing donors in their respective project life cycles (pre-design, design, construction and post-construction phases), the structural description profile of their designed turn-over dwelling units, and the actual condition of these dwelling units in resettlement sites. Study results indicate that only one out of seven housing programs is considered sustainable, based from study parameters.

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1. Background of the Study and Related Literature Review

The Albay province in the Bicol region, Philippines was assessed thru government-sanctioned hazard mapping as having “highest risk” to climatic disasters [6] [16] where the most notable were the typhoons Xangsane last September 2006 and Durian last November 2006, claiming at least 14 and 1,000 lives respectively, with estimated damages at Php 5 billion. The municipalities of Legaspi, Daraga and Camalig, all within the political jurisdiction of Albay province, were the study locale, containing the highest variation and concentration of these post-disaster...
housing units. These calamities prompted the Philippine government in allotting 750 million pesos for both new housing construction in resettlement sites (displaced by mudslides), and repair of existing houses for the economically-disadvantaged inhabitants, while there was an influx of international non-governmental organizations (NGO) who provided financial assistance in the housing delivery thru sweat equity mode except for International Organization for Migration which provided housing on a turn-key basis. However there was a tendency that relief organizations will have an *ad hoc* tactical decision making in planning for household reconstruction, which can be prone to errors and risks [10] and donors’ involvement with *risk management* depends on internal coordination among actors and competition of interests with external priorities [3]. Moreover, the local authorities (National Housing Authority) who provided resettlement sites commented that most of these NGO-provided housing units failed to secure any municipal building permits nor did not pass through NHA for preliminary approval due to time constraints.

Disaster risks for the dwelling unit include possible physical damage, livelihood disruption and loss of human lives caused by materials shortchanging or faulty engineering design on the housing donor’s side (one of technological hazards) [20] [21] or housing recipient’s side [4] [19] [2] [23] [18]. where the outcome of a disaster is shaped both by the physical nature of the hazard and the vulnerability of people who are involved like those residing in hazard-prone locations, substandard housing quality and lack of disaster preparedness [4]. Any lapses in the conduct of post-disaster housing programs will give way to possible risks to future natural calamities as well [23]. Limited studies have been made on evaluating risk management on the project life cycle among donors, either NGO-based or governmental, for mass housing. The Project Management Institute [17] states that there is no fixed template on such scope of a project life cycle (PLC) which can be used across all industries and disciplines, but this depends on the objectives of an organization or firm, where only few are identical [17]. However, Morris [14] described a typical construction project life cycle from feasibility stage, project planning and design, production and lastly turnover and start-up (which includes final testing and maintenance). In the light of increasing occurrences of natural disasters brought upon by climate change, it is necessary to investigate if such housing donor already includes *risk management* in its typical PLC, which depends also on the donor’s objectives and intended end-results. Risk management is the systematic approach and practice of managing *uncertainty* to minimize potential harm and loss [20] while Christopoulos, Mitchell and Liljelund [5] refer to it to both —*mitigational* (minimizing the destructive effects of disasters) and *preparedness* (readiness of a society to *forecast*, take precautionary measures and respond to an impending disaster). Risk in turn is defined as the effect of *uncertainty* on the organization’s objectives. An effect is a deviation from the expected end-results [9]. And that *uncertainty* refers to the natural calamities, to which man *cannot* exercise control. These natural calamities, will become a *disaster*, when the vulnerabilities exceed the combined capacities of the housing beneficiaries and the built environment. Both the vulnerabilities and capacities however, can be controlled by man. The common goal of these housing donors is to provide either permanent housing or *transitional* shelters, considered as one of man’s primordial needs [13], for the beneficiaries, not to mention other types of non-housing support. However, in the context of natural disaster resiliency, it is very much important to examine the exact scope of each housing donor in their existing project delivery systems, whether these only includes *until building turnover* to the beneficiaries or even up to *facilities administration and maintenance*.

Thus, in order to make the housing delivery by the donors disaster-resilient (or resistant), it is imperative that risk management measures be routinely implemented in the operations of a typical housing project. A project life cycle should ideally have any form of risk management in its project life cycle [17] where the latter is recognized as one of the critical procedures and capability areas in the field of *project management*. Recently, due to the increasing threats brought upon by climate change and natural disasters, ISO (International Organization of Standardization), the foremost global name in standardization, recently developed the ISO 31000:2009 in November 2009, which provides general guidelines, principles and framework for *risk management* from across different countries [11]. However, unlike with other standards it already developed, there’s no certification issued for this particular ISO variant, rather it sets an arbitrary set of guidelines which can be adapted by any firm or industry, of whatever nature, on risk management, which is a tool for achieving sustainability [12], supporting the Hyogo Framework of Action 2005-2015, Philippine Disaster Risk Reduction and Management Act (R.A. 10121), UN/ISDR [20] and other related official declarations and statutes in dealing with natural disasters and climate change, since risk management includes a careful foresight of any “uncertainty” that can undermine the normal delivery of their projects, in this case, *mass housing* by NGOs and government agencies. On the other hand, ISO 31000:2009 consists of eleven (11) core principles, namely 1.) *it creates and protects value* - which should demonstrate achievement of objectives and improvement of performance, 2.) *is an integral part of all*
organizational processes, which can be the entire life cycle of a project, 3.) is part of decision-making, 4.) explicitly addresses uncertainty, 5.) is systematic, structured and timely, 6.) is based on best available information, 7.) is tailored to the needs of the organization or project, 8.) takes human and cultural factors into account, 9.) is transparent and inclusive, 10.) is dynamic, iterative and responsive to the needs of change, and 11.) facilitates continual improvement of the organization. These principles should be practiced with at all levels, in order for the risk management in an organization to be effective [9]. These eleven principles, which explicitly addresses uncertainty, were used as a backbone for the assessment on the extent and degree of practice of risk management by the housing donor organizations who were involved in the mass housing project in the resettlement sites in Bicol, during the entire project life cycle (pre-design to post-construction), ensuring accountability for all stakeholders, removing any gaps in the risk communication, adaptable and flexible which can be easily enhanced, where continuous communication and consultation are very much important with both external and internal stakeholders at all stages, so that issues related to risks, causes and consequences and measures can be discussed further and settled. This set-up ensures that those who are accountable and responsible for implementing the process understands the basis of those decisions and what are needed to implement them [9].

2. Methodology

The objectives of this paper are (a.) to assess and compare the level of risk management practices among, and within each of the seven (7) housing donors who participated in the study during the entire project life cycle (PLC) consisting of pre-design, design, construction and post-construction phases of their respective housing projects based from the eleven (11) core principles of ISO 31000:2009, (b.) to quantify and present the level of disaster-resistance of the different housing design variants and given the results of the first two objectives, (c.) to determine if the housing project delivery among these donors are sustainable or not. This study however, does not include housing beneficiaries’ disaster risk perception level, which is discussed in a separate study.

Thus, to address the first objective, test instrument ‘A’ on risk management was distributed among the housing organizations. There were seven (7) organizations (five international and two local) who participated in this study, representing a high majority of all post-disaster housing that were built in the relocation sites covered in this study. Each donor organization had their four (4) distinct personnel answer separately either any of the four (4) PLC phases Pre-design, Design, Construction and Post-Construction test instrument ‘A’ on what they would do on various situations based on the eleven (11) ISO 31000:2009 core principles. Each survey form, having different contents for each PLC phase, has eleven (11) incomplete situational statements with three completing ending statements, which is rating scale-coded (from 1 to 3). These personnel have direct involvement with each of the PLC phase. Thus, there was a total of twenty-eight (28) respondents coming from seven (7) organizations. They were statistically assessed within each organization (comparing Degree of Practicing ISO 31000:2009 Principles among Pre-Design, Design, Construction and Post-Construction phases) and among the seven (7) organizations (comparing the over-all degree of practicing ISO risk management of one organization with the other donors) based on ONE WAY ANOVA. The baseline score range between 1.00 to 1.49 is interpreted as highly practiced, followed by 1.50 to 2.49 (somewhat practiced) and 2.50 to 3.00 (not practiced), based from the mean of the eleven (11) statements per PLC phase per survey form. The survey form was jointly prepared by the researcher and an external consultant-psychologist and consulted with an expert on ISO.

For the second objective, the disaster-resistance to earthquake, typhoon and flooding of these post-disaster houses were investigated based on the data gathered from - firstly, structural description profile of the nine (9) housing designs (based from blueprints or electronic files of working drawings provided by donors), secondly, the actual housing damage level survey that were answered by the housing beneficiaries, third, ocular visits and photo documentation by the researchers to the resettlement sites to ascertain the actual condition of these houses for the period January 2007 to October 2012, fourth, interviews with the technical personnel among the housing donors for clarification on architectural and structural details on housing designs, and lastly, focus group discussions with the housing beneficiaries.

The nine (9) housing design variants came from seven (7) housing donors who participated in this study. Except for Habitat for Humanity and Operation Compassion-Amore which have two housing design variants each, the rest of the donors employed one housing design variant. The housing design variants that were evaluated were built in four (4) separate locations in Albay Province – in Taysan in Legaspi, Camalig in Tagaytay, Anislag Phase II
in Daraga, all of which were government-owned relocation sites (under National Housing Authority’s (NHA) jurisdiction) and Daraga (privately-owned land, under Amore). Except for Habitat housing variants which used either steel frame-and-fiber-cement board combination [HAB-SF design] or load-bearing interlocking masonry blocks for walls without columns [HAB-MAS design], the rest employs traditional reinforced concrete system (normal concrete masonry walls, tied beams, tied columns, tied footings and slabs). For the roofing systems, only the IOM uses a slightly-sloped reinforced concrete slab, while the rest, either steel purlins and rafters or wooden truss members covered with corrugated galvanized steel roofs. Of the seven (7) housing donors, only one came from the government (DSWD), the rest were NGO’s. Of the six (6) NGOs, Habitat for Humanity (HAB), Gawad Kalinga (GK), International Organization for Migration (IOM), Operation Compassion (OC) and Daughters of Charity (DC) were international donors, while Community Organizations of the Philippines Enterprise (COPE) operates only in the Philippines.

There were two test instruments (‘B’ and ‘C’) employed to address the second objective. Test instrument ‘B’ on structural description profile of housing design variant is a rating scale-coded (from 1 to 4) descriptive assessment survey form, represented by four (4) descriptive sub-statements, with increasing level of structural resistance to natural disasters for each descriptive sub-statements 1 to 4. Each four (4) descriptive sub-statements, with graphic images, makes up to one (1) descriptive general statement, and the entire survey kit consists of fifty-six (56) descriptive general statements, covering practically every part of the dwelling unit that was divided into four (4) major parts, namely – physical dimensions of structural elements, and number, spacing and thickness of steel reinforcements for firstly, foundation, secondly, structural frames (beams, columns and walls), thirdly, trusses or rafters with purlins and shape of the roof, and lastly, environmental factors (typhoons, earthquakes and floods). These four (4) major parts considers both (a.) the physical description of the structure itself (as listed above) and (b.) the site conditions (environmental factors such as location of water table beneath, soil bearing capacities, distance from earthquake fault lines, siting of dwellings with respect to landslide potential, among others) where the said structure is situated [8]. These fifty-six (56) general descriptive statements were adapted from the United Nations [22], and other relevant building codes, for both architectural design and structural engineering. The baseline score is between minimum of 3.0 to a maximum of 4.0, from the mean of the combined scores of all fifty-six (56) descriptive general statements where it is assumed that the minimum structural requirements for Intensity 9.0 Earthquake, National Structural Code of the Philippines (NSCP) Zone IV (250 Kph) wind load and 3.0 meter high flooding were satisfactorily met, that were jointly prepared and for sole use by the researcher and the external consultant (structural engineer). The descriptive general and sub-statements are based from a complete structural computation of a typical single-storey dwelling respectively [1] [7] [15]. If the over-all mean score is between 1.00 to 1.99, and 2.00 to 2.99 these indicates being highly disaster-prone and disaster-prone.

Meanwhile, test instrument ‘C’ on Actual Housing Damage Level survey form, has a similar rating scale set-up (1 to 4) with that of the Structural Description Assessment Form, however, contains three (3) major parts, namely typhoon (with three general descriptive statements), earthquake (with four general descriptive statements) and flooding (two general descriptive statements). Each part was treated separately in obtaining their mean rating scale scores. Each of the natural calamity (typhoon, earthquake and flooding) has their own respective descriptive sub-statements for each part of dwelling part (roof, walls, windows/doors, columns, beams, entire dwelling unit), assigned with rating scale coded values from 1 to 4, based on extent of damage caused by each calamity. Graphic images were provided for each of the rating scale-coded statement. Minimum baseline mean score per calamity is 3.00 (up to maximum 4.00) which is interpreted as not vulnerable to damage, while scores lower than 3.00 (1.00 to 1.99, and 2.00 to 2.99) are interpreted as highly vulnerable to damage, respectively. This highly graphic self-assessment survey form was answered by the housing beneficiaries, at least eighteen (18) years of age, based from their experiences and observations on any subsequent actual damage on their donor-provided housing units upon their relocation to the resettlement sites. Test instruments ‘B’ and ‘C’ were jointly prepared by the researcher and an external consultant-structural engineer. The entire study duration took nine (9) months.

3. Results and Findings

Shown at Figure 1 below is the level of risk management practice among seven (7) housing donors. Only Principles 5 (systematic, structured and timely), 7 (tailored to the needs of the organization) and 9 (transparent and inclusive) are highly practised, while the rest as somewhat practiced with scores exceeding 1.49.
Examining Principle No. 5 (*Risk Management is Systematic, Structured and Timely*), which implies that generally, the seven (7) housing donor organizations have systematic and organized measures in practicing risk management along their pre-design, design, post-construction and post-construction phases of their post-disaster housing supply chain.

Examining the *highly practiced* Principle 7 (*Risk Management is Tailored*) which implies that generally, the seven (7) housing donor organizations practices risk management that is personalized to their needs.

The last generally *highly practiced* Principle No. 9 (*Risk Management is Transparent and Inclusive*) among housing donor organizations imply that the respective project life cycle of these housing donors have been participatory and inclusive one in terms of dealing with risks along its pre-design, design, construction and post-construction practices in the delivery of post-disaster housing units.

Meanwhile, across all seven (7) housing donors, generally, they have decreasing risk management levels from across the PLC phases (pre-design to post-construction) as evidenced with the increasing mean scores, shown in Figure 2 above.

In terms of determining any significant difference of over-all degree of risk management practice (entire project life cycle) among the seven donors thru ONE-WAY ANOVA, the computed value is 3.919 with sig value at 0.002 indicating a highly divergent level of risk management practice among these seven donors. While determining if there are any significant difference on degree of risk management practice among the respective pre-design, design, construction and post-construction phases per donor, results indicate that only IOM has a significant difference with computed value of 4.145 and sig 0.012, while the rest as consistently the same (HAB cv-0.265,sig-0.589 / DC cv-2.740,sig-0.056 / GK cv-0.102,sig-0.958 / COPE cv-1.054,sig-0.379 / OC cv-1.510, sig-0.227 / DSWD cv-1.225, sig-0.313).

As shown in Figure 3 below, for Test Instrument ‘B’ *structural description* profile mean scores of at least 3.00, only six (6) of the nine (9) housing design variants were considered *disaster-resistant* over-all based from the fifty-six (56) descriptive statements. The same results apply when delving deeper, in terms of the first part only, (30 statements on physical description), design variants DC, GK and DSWD were considered *disaster-prone*. However, in terms of the second part (26 statements on site condition), all of the housing design variants were considered *disaster-resistant*. Moreover, based from interviews with the donors, the housing design for most of them were merely based from “rule of thumb,” discounting any need for engineering calculations since the structure is only of single story level only, basing from previously-delivered projects in other locations.
Related to this, for the results of Test Instrument ‘C’ on actual housing damage level (as shown in Figure 4 above) due to subsequent natural calamities that hit the resettlement sites, all of the housing design variants were considered not vulnerable to damage (mean scores range between 3.85 to 4.00). Actual site inspection and photo documentation however indicate deterioration of steel roof purlins for the COPE housing design variant (see Figure 9 below), while the rest of the housing design variants have normal wear and tear on its wooden members (if there are any) like doors and windows due to both termites and exposure to harsh weather elements. In addition to that, focus group discussion with the beneficiaries indicate that the housing units suffer termites infestation endemic to the site which caused physical damage to the wooden doors and windows already, and as of this writing, haven’t reached yet the roofing support members for some housing design variants with wooden purlins and rafters. Further spread might possibly undermine the structural integrity of the roofing system. To summarize, in order to fully assess the disaster-resistance of these donor-provided dwelling units based from Test Instruments ‘B’ and ‘C’ and ocular inspection, these were shown in Table 1 below with its overall disaster-resistance level interpretation, versus the risk management practice level among housing donors based from Test Instrument ‘A.’

Only Habitat for Humanity has “both” high levels of risk management practices across its pre-design, design, construction and post-construction phases, as well with house design assessed as disaster resistant over-all.
4. Discussion, Conclusion and Recommendations

The primary reason why the level of risk management practices based from ISO 31000:2009 principles and the housing design were both assessed in this study, is to demonstrate that risk communication is a chain which should flow continuously, and not isolated nor intermittently practiced in one or some of the PLC phases. Risk has to be communicated and addressed from the donor’s side, to the housing design and its construction up to the beneficiaries, in order to effectively address any forms of uncertainty. Practicing a high level of risk management will address preemptively any form of risk. Given that the structures were built more than six years already (1997-2014), and the study was conducted almost two years ago, the following conclusions were derived upon:

1. As shown in Figure 3, Only HAB, OC and IOM housing design variants are disaster-resistant over-all, based from triangulated investigation from its structural profile based from both architectural features and engineering calculations, site condition, actual housing damage level due to subsequent natural calamities in resettlement sites, up to its actual condition for the past more than six (6) years. Site selection was fairly safe from earthquake, tsunami and flooding but termite presence and tropical considerations like rains (which led to rusting of houses with steel purlins) were overlooked upon, as shown in Figures 5 and 6 above.

2. Only HAB has a highly practiced risk management, the rest of the donors somewhat practices risk management which leaves room for not addressing any form of uncertainty. This is based from Figure 1. This might be attributed to its sole objective of providing quality housing units, with vast experience across all countries since the late 1970s, compared to the other donors who have numerous concerns, not only housing to attend to.

3. IOM has a highly divergent risk management practice levels (between least practiced to mostly somewhat practiced) within its entire project life cycle (PLC), which imply that risk management application was given unequal emphasis among its Pre-design, Design, Construction and Post-Construction personnel, though there were attempts as well, but were not fully communicated nor translated to practice with the least concern during Post-construction phase, attributed partly to the sturdy and rigid construction of their dwelling units, having a solid reinforced concrete roof slab, compared with the other donors using trussed or with-rafter galvanized steel roofs, and was delivered thru a “turn-key” mode of delivery thus having limited contact with the beneficiaries, where housing construction was “contracted” to the skilled workmen among the beneficiaries, unlike the rest of the donors, based on “sweat equity,” thus “leaving after doing its part.” [24]. This is based from Figures 2 and 4 above.

4. Housing donors generally have a rather informal system of addressing risks due to time constraints and these housing variants were mostly designed by “rule-of-thumb,” since these are single-stories not requiring seismic computation.

5. Housing donors generally have a “conceptual” idea of a “disaster-resistant:” housing that are both “safe” and “secure.” This is attributed to the lack of technical know-how among the donors, and usually fluid and organic nature of their task assignments, brought upon by rapid project turnover. Most house designs were either done by a non-licensed trainee, or acquired thru donation of professional services, or by a professional on a per-project basis, attributed to economic issues, coupled with the lack of an efficient records-keeping system of their house design working drawings among the across concerned personnel for each PLC phase for each donor.

6. There is a disconnect on study findings between Risk Management Practice level versus that of the over-all Disaster-Resistance level among the housing donors in Table 1, except for Habitat for Humanity (HAB). This indicates generally, donors have differing, spotty or inconsistent level of practicing risk management among their respective pre-design, design, construction and post-construction phases. Moreover, for most donors, the risk management practice level over-all among donors was interpreted as somewhat practiced, and not highly practiced, leaving room for possible risks, thus making the entire housing program, unsustainable, in the long term.

Given the above findings and conclusions, the following are recommended:

1. Housing design customized per province should be done by the National Housing Authority (NHA) since it has the strategic connection with the other government agencies like Philippine Institute of Volcanology and Seismology (PHIVOLCS), National Mapping and Resource Information Authority (NAMRIA), PAGASA, Mines and Geosciences Bureau (MGB) and National Disaster Coordinating Council (NDCC). But NHA should forge strategic dialogue with local built industry professionals and local residents in each province in the design of a specific housing design specially adapted to their location vis-à-vis set a cap on construction costs. This follows the principle of Integrated Design Process (IDP) to ensure sustainability of mass housing programs. A national database of these government-provided housing design variants should be easily available in times of immediate post-
disaster reconstruction. In this way, sustainability of mass housing programs are ensured, avoiding wastage of resources based from the above-listed conclusion No.1. However, if there is sufficient time, the same set-up should be made on the donor’s side, plus the stakeholders mentioned above.

2. However, further studies for housing design variants which allow room for personalization by the housing beneficiaries without jeopardizing the structural disaster-resistance level is strongly encouraged. Highly user-friendly house maintenance checklists and manuals can be made for these beneficiaries, and spot checks by an NHA representative across time, can be made on these dwelling units.

3. The housing donor can then focus on efficient records-keeping of their housing design variants from the e-files of working drawings, material specifications, bill of materials, up to actual cost estimates, and project documentation of each completed project indicating post-project analysis by an assigned personnel during that project, given the organic nature of their task assignments. This is very important for future enhancements for their future housing programs. In this simple way, risk communication can then be coursed thru effectively across all channels which will inform all the donor’s team members on the structural limitations of their housing designs and any possible flaws in project delivery such as materials procurement and construction issues which they can preemptively address for future projects. Management of risks therefore is addressed dynamically, and improved continually.

Reference List