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Sustainability by design: the challenge of shelter in post disaster reconstruction

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Abstract

The idea of 'sustainability' is embedded in academia as well as in practice. It has the promise of doing something today, which will support tomorrow's generation. In practice it can be prescriptive, generalized and formulaic; which can hide the opportunity and superior value that can be achieved through "Sustainability by Design" (SbD)..... rather than sustainability by prescription.
This paper looks at the particular context of post disaster reconstruction through 3 selected cases studies, namely i) The house design for Delmas 19 in Port au Prince following the Haiti Earthquake in 2010, ii) The provision of appropriate roofing assistance following the 2013 Typhoon Haiyan (Yolanda) in the Philippines, iii) The winterisation strategy of shelter (and non food items) following the 2014 Floods in Northern Afghanistan.
The post disaster context by it's nature requires "doing something today" but how will that "support tomorrow's generation"? The case studies have been selected to underline the SbD approach in practice and how the link between these two was sought.

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1. Sustainability by design, the shelter challenge

The loss of housing in a disaster has impacts in many other areas. For example, it means a sudden loss of security and privacy. It means that the health of the family that lived in it could be compromised; and it means that education could be postponed (or at least interrupted) and that the economy around the neighbourhood could collapse. In addition, "informal" rebuilding could have detrimental impacts on the environment and resources, it may drive building materials and labour costs up and potentially pull quality and standards down. The social structures and cultural places and practices that were there before may not be after the disaster. The economics and livelihoods of the family can be affected by the need to replace the former house while at the same time continue paying off loans perhaps on the previous house or contents but now being unemployed. This may (by necessity) result in "women and children being forced to work in dangerous conditions to gain income and food, a social impact" (Wikipedia, 2014, 1). Consequently, the loss of housing or shelter is connected and can trigger other perhaps unexpected impacts well beyond the sole loss of a house. Nonetheless, the sustainable design of housing/shelter can seemingly have the opposite long lasting impacts as portrayed in the movie "The Shelter Effect" produced by the International Federation of the Red Cross Red Crescent Societies (IFRC) (IFRC, 2014). In that short video, changes such as raising the house by 2 steps, treating the timber for water flooding and putting a concrete floor under it had dramatic and positive outcomes in terms of safety, savings, livelihoods, water access, health and finally education and a school for the community, albeit over the subsequent years. This is the goal of sustainability that can be achieved through SbD.

→ sustainability by Design...

2. Sustainability in disaster tools

The major sustainability tool for post disaster reconstruction is QSAND (Quantifying Sustainability in the Aftermath of Natural Disasters). It is a self-assessment tool to promote and inform sustainable approaches to relief, recovery and reconstruction after a natural disaster (QSAND, 2014). Its key objectives are:

- To guide and inform the decision-making process in a disaster-affected community, promoting more sustainable approaches to shelter and settlement activities.
- To provide a coordinated framework for identifying and, where relevant, assessing the sustainability of solutions in the relief, recovery and reconstruction of disaster-affected communities.

It sets up an apparent holistic approach across "eight categories within which sustainability issues relating to the reconstruction of a sustainable built environment are assessed" as shown in figure 1 below.

Fig.1. The QSAND Approach
Source: QSAND web page

Interestingly the QSAND approach includes "Cross-Cutting Issues" that should "achieve enhanced benefit in each of these categories". However, as with many tools it essentially devalues design (and hence SbD) and suggests that it is the coordination of seemingly "set issues" that will produce a sustainable outcome.

Table 1. The perceived issues within each QSAND category

Shelter and Community	Settlement	Material and Waste	Energy
Privacy Internal environment Community sensitive design Construction approaches	Site selection Security of tenure Spatial planning Infrastructure	Post disaster waste management Construction waste management Operational waste management Material properties/specification Material sourcing	Energy demand and supply Energy consumption
Water and Sanitation	**Natural Environ.**	**Communications**	**Cross – Cutting Issues**
Water demand and supply Water quality Sanitation	Human relationship to ecosystem service Ecological protection Ecological rehabilitation and restoration	Telecommunication	Participation capability and skills Security and safety Economic viability Community ownership and sustainable management Livelihoods Resilience Access and non-discrimination

In practice it is problematic achieving balance and priority across the 8 categories and the tool can quickly default to a mere check list. For example, what would the cross cutting issue of resilience mean for shelter and community and moreover how would it be measured? What are livelihoods as opposed to cash for work programmes and how does one balance that against the need for say ecological protection? The system then seems to fall back to the application of previous exemplars without necessarily checking whether that context is relevant to the current one.

A more specific tool and approach is PASSA (PASSA 2011) (Participatory Approach for Safe Shelter Awareness). It is "a participatory method of disaster risk reduction (DRR) related to shelter safety and came from earlier work in the Water and Sanitation sector of humanitarian aid. Its aim is to develop local capacity to reduce shelter-related risk by raising awareness through the identification of risks and vulnerabilities within the community and the subsequent development of strategies to counter these risks and vulnerabilities. The approach is seemingly straight forward however its application can be protracted over many months or even years. Such participatory methods seem to be based on the belief that everybody in a group has knowledge and ideas to contribute and that the solutions to shared problems can be found by people working together effectively. Again in practice, this may not be the case and those volunteering to be part of PASSA may have other personal, family or neighbourhood goals other than necessarily finding a strategy for a "shared problem". Nonetheless, it can produce master plans and identify unexpected issues within the community that may not have been readily found otherwise..... however, there can be unexpected costs and slanting of such strategies when they are applied. For example one undocumented strategy recommended by a community in Port au Prince Haiti was for a card (gambling) competition. However that aside it does not start with the framework assumptions that QSAND does but lets them emerge from the engagement of the community.

The Talk to the Buildings (T^3B) approach (Potangaroa 2008) is perhaps one of the few approaches that seeks a "design" component. T^3B is a process that maps the architectural patterns that ostensibly makes a house a home...and by doing that achieve the sustainability and "intergenerational connection" discussed earlier. It was developed from work by Cooper (Copper 1995) and Brand (Brand 1994) and is grounded in the Patterns of Alexander (Alexander et al 1977) and more recently Jacobson (Jacobson et al 2002).

The original 250 Patterns suggested by Alexander et al in 1977 were trimmed back to what Jacobson et al (who was part of Alexander's team in 1977) describes as the 10 Essential Patterns "that form the essence of home". They suggested that "while it seems to us that the original notion – that good houses are made of deep, traditional patterns, grounded in human experience- is still valid, practice has made us realize that the really crucial patterns are far fewer in number than we had previously thought; and that this smaller group of patterns is more powerful than we had previously imagined". They go on to state that "While there may be many dozens, even hundreds of patterns that go into the making of homes, there is only a handful that we now say are essential". These are the 10 patterns tabulated below that forms the basis of the T^3B Approach.

Table 2: The 10 Essential Patterns of a "Home"

	Pattern	Description
1	Inhabiting the site	If the form of the house doesn't begin by responding to the site, house and site may well end up in conflict with each other
2	Creating rooms, outside and in	a lively balance of indoor and outdoor rooms
3	Places in between	Places that allow you to inhabit the edge, that offer enough exposure to make you aware of your surroundings, and that provide just enough protection to make that awareness comfortable
4	Refuge and outlook	At its simplest we are inside looking out
5	Private edges, common core	A good home balances private and communal space throughout
6	The flow through rooms	Movement through a room affects the room itself
7	Composing with materials	Choosing its materials – to support, frame, fill, cover, colour and texture space – is the act of composing the home
8	Sheltering roof	More than any other single element, the form of the roof – as experienced both outside and in – carries the look and meaning of shelter, of home
9	Parts in proportion	A home is a hierarchy of parts in proportion
10	Capturing light	Good homes capture light – filter it, reflect it – in ways that, no matter the season or time of day, delight their inhabitants

The three tools operate at different scales, timelines, coordination levels, focus and design. QSAND has a broad overall coordination of the community and outside agencies approach while PASSA has a seemingly neutral community participation focus. Both take time. And then there is the individual family and design focus of T^3B that can be readily deployed with rapid responses.

3. Methodology: the case study approach

However, the issue is one of methodology. Yin (yin 2003) comments that "In general, case studies are the preferred strategy when "how" or "why" questions are being posed, when the Investigator has little control over events, and when the focus is on a contemporary phenomenon within some real-life context. Such explanatory case studies also can be complemented by two other types-exploratory and descriptive case studies. Regardless of the type of case study, investigators must exercise great care in designing and doing case studies to overcome the traditional criticisms of the method."

One of these is the causality capacity of a case study. For example, a scientific experiment is set up to determine such causality by being repeated but under differing conditions. Case studies by their nature seemingly cannot. However, Groat and Wang (Groat &Wang 2002) argue that case studies can and are "explanatory, descriptive and/or exploratory" and back this up with several examples. In addition, the case studies are coupled to the PEAS approach (Hamdi 2010) that has a logical-causal path from what we are providing through to sustainability; and this have been included at the start of each case study.

The question posed at the start was how "doing something today" could be linked to "supporting tomorrow's generation" and the suggestion was by using a SbD approach and this is explored in the following selected case studies.

4. Case study 1: Haiti house design Delmas 19

Table 3. Case study 1 data

Disaster:	Port au Prince Haiti following the January 2010 Earthquake
P: Providing	Informal settlement housing
E: Enabling	Earthquake strength and community engagement
A: The capacity to be adaptive	Wall layout determined by occupants. Note that the walls could be taken out and relocated and so long as the structural "L" columns were maintained would have the required code seismic loading capacity.
S: The capacity to sustain.	Sustainability by design spatially, seismically and by community engagement in terms of wall layout and usage (for example as a shop). Note that it had been designed and "invited" the house occupants to fill in the 2nd floor for either renting or for other family members.

A shallow earthquake hit Port au Prince, Haiti just before sunset on the 10 January 2010. The impacts were devastating with a reported 220,000 deaths with some variance between different estimates; an estimated three million people were affected and 250,000 residences and 30,000 commercial buildings collapsed (Wikipedia, 2010).

Different aid agencies were then involved in different geographical areas throughout the city and this case study considers one agency's shelter response in the suburb of Delmas 19. This is an urban based informal settlement consisting of 1 and 2 storey homes typically built in concrete block or masonry.

A T^3B study was conducted and the conclusions from 20 house surveys were as follows:

- The dominant spatial/social area was the space immediately inside the house, followed by the kitchen, the dining and bedroom equal 3rd and finally the area immediately outside.
- The most commonly seen Pattern was 7 followed by 9, 1 and 6 (in that order)
- The least seen was Pattern 10 followed by 3, 4 and 2 (in that order).
- The area immediately outside needs to address Patterns 2, 3, 4 and 10.
- The area immediately inside needs to address Pattern 10
- The dining area needs to address Patterns 2, 3, 4 and 10.
- The kitchen area needs to address Patterns 3, 4, 5 and 10.
- The bedroom needs to address Patterns 2, 3, 4, 5 and 10.

Examples of these are shown in figure 2a to 2d below.

Fig. 2a. Examples of Patterns 2, 3, 4 and 5 in Delmas 19 Immediately Outside

Fig. 2b. Examples of Patterns 2, 3, 4 and 5 in Delmas 19 Immediately Inside

Fig. 2c. Examples of Patterns 8, 6 and 9 in Delmas 19

Fig. 2d. Examples of Patterns 10 in Delmas 19

The major outcome from this analysis was the social (and therefore the design) importance of the area immediately inside the house. Hence, the two front columns of the proposed house design were moved 1.80 metres thus completely freeing the front area shown by the arrows on figure 3 below. This created a possible front "porch", a shop or an additional room.

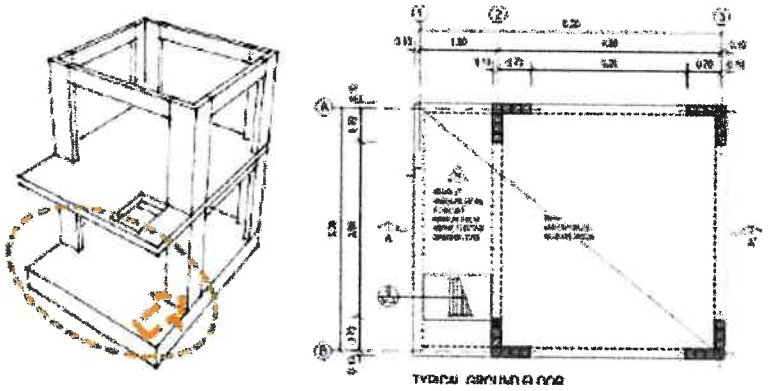

Fig. 3. Isometric and ground floor plan of the proposed new house

The suggested design is a two storey structure of footprint size 6.4 x 5.2 metres giving an area of 33.28 m^2 (note dimensions shown on the plans are to centre lines). It is essentially built in 200mm reinforced concrete block or masonry. It is supported and braced by 4 "L" shaped columns that are 800mm x 800mm (2 block modules in each direction). The first floor is a concrete slab with concrete block infill which is the norm for Port au Prince while the ground floor is a non structural concrete screed cast on back fill material. There are concrete block beams at both first and roof levels and a 1000 mm deep foundation beam. An access hole has been allowed in the front for a steel ladder/stair case which is also the norm in Delmas 19. Costs were around $6,560USD up to the first floor level and $8,920USD up to the roof level (or $268/$m^2$ USD compared to $400/$m^2$ for comparable housing but including walls).

But could such a house, supplied without walls which would be determined by the building occupants. Have the potential to "blend" into Delmas 19? Five different perspectives were completed in figure 4 below showing the following:

- The house with the top level not yet developed, front porch grilled in
- The front porch open on the lower level and grilled in on the upper one
- The front porch grilled on both levels
- The front porch closed in on the ground level but open on the upper one Note different entry.

The only real points of artistic license were that the foundations for first four are too low and should be more like the 5th example; the safety wall is not shown in the 1st; the staircase is not shown in the 2nd and 3rd and seemingly all are on corner sites. Nevertheless, the houses visually appear to sit well in the Delmas 19 context.

Fig. 4. An artist's impressions of the house

5. Case study 2: roofing assistance in The Philippines

Table 4. Case study 2 data

Disaster:	Typhoon Haiyan (Yolanda) Nov 2013
P: Providing	Shelter materials and in particular
E: Enabling	Construction of transitional housing
A: The capacity to be adaptive	Roofing is readily transferable and transportable building item of high value.
S: The capacity to sustain.	Sustainability by appropriate material selection. Moreover, roofing is synonymous with shelter.

People affected by Typhoon Yolanda had 3 shelter options available to them that were as follows:

- Stay with family
- Move into an evacuation centre
- Go back to their home.

The emergency shelter assistance provided consisted of tarps, tents and shelter kits. This is quite normal and standard. But after one month the reaction from those being assisted and the observations in the field was that the shelter assistance should include corrugated galvanised iron (cgi) roofing. However, cgi is a transferable and transportable shelter item of high value and the agency involved needed to have some basis for this as they would be the first and it would probably mean that other agencies would need to follow.

A Quality of Life (QoL) tool called the DASS42 (DASS42 2006) (Lovibond 1995) was used in Leyte on 12 December 2013 to ascertain whether it was the "right" time and also (because it was possible) to check and potentially prioritise the vulnerability criteria. Altogether, 121 DASS42 surveys were completed.

The average values for the three self reporting scales within the DASS42 and their severity characterisation were as follows:

- Depression 18.4 characterised as Moderate
- Anxiety 20.7 characterised as Extremely Severe
- Stress 21.0 characterised as Moderate.

These suggest that even by the 12 December (just over 1 month since the November 8 Typhoon) distribution of cgi would have been appropriate. "Depression" (a fixation about the ways things were before the typhoon) was moderate while anxiety (concern about the future and how they may survive) was at an extremely high level. People affected by disaster initially display higher Depression values compared to Anxiety which is reversed as those affected start to seek longer term solutions and the future..... and hence their calls for cgi. This was seemingly both a rapid change and a resilient community response confirming their calls and our observations.

The analysis of the DASS42 survey further suggests that females were more affected than males (see table 3

below). This is not to suggest that being a female is a "vulnerability" but they were nonetheless one severity level higher across 2 of the DASS42 scales. Hence, they seemed to have been more impacted than the males and perhaps should be figure more in any cgi and any future shelter initiatives.

Table 5. Characterisation of DASS42 data based on the severity tables by gender

	Females	Males
Depression	18.4 (moderate)	13.8 (moderate)
Anxiety	21.3 (extremely severe)	14.8 (severe)
Stress	21.6 (moderate)	14.9 (mild)

Interestingly, the impact of the typhoon appears to have been spread across the age groupings surveyed (see table 4 below). This is not usually the case and often one age group will stand out from others. That wasn't the case here.

Table 6. Characterisation of DASS42 Data Based on the Severity Tables by Age

	Depression	Anxiety	Stress
Less than 30 years	18.3 (moderate)	21.4 (extremely severe	21.4 (moderate)
30-39 years	17.1 (moderate)	18.3 (extremely severe	20.3 (moderate)
40-49 years	18.1 (moderate)	19.9 (extremely severe)	20.3 (moderate)
50+ years	19.7 (moderate)	22.6 (extremely severe	21.9 (moderate)

The data was then split into two groups; those with a "severe" rating or higher on the anxiety scale were grouped as "Unhappy" while those with a moderate ranking or below were grouped as "Happy". The sensitivity of this cut off against the findings below was checked and found to be insignificant.

The 6 vulnerability factors below used by the agency were as follows:

- No. of household (HH) members
- No. of children below 5
- FHH Female head of Household
- PWD People with disabilities
- Elderly
- PLW Pregnant and Lactating Mother

These were then ranked against the averaged anxiety for the "Unhappy" group. They were then compared to the "Happy" group for a secondary confirmation which is tabulated in table 5 below. Theoretically the rankings in the Unhappy group should be the reverse of the Happy one.

Table 7. Prioritisation of the Agency's vulnerability criteria and suggested Weighting Factors

ACCORD Criteria	Number	"Unhappy" Ranking	"Happy" Ranking	Calculated Weighting Factor	Suggested Weighting Factors
No. of HH member	84	5	1	2.4	2.4
No. of children below 5	54	2	2	2.6	2.6
FHH Female head of Household	27	4	3	2.5	2.5
PWD People with disabilities	2	1	4	3.2	2.0
Elderly	15	3	5	2.3	2.3
PLW Pregnant and Lactating Mother	11	6	6	2.1	2.1
Income					2.0

The highest ranking of PWD should be tempered by the thinnest of the data with there being only 2 cases within the "Unhappy" data division. Certainly, PWD could and will be a significant factor in terms of a HH/families overall "vulnerability" once more data has been collated. Next are children under 5 and the Elderly. Then FHH ranked 4th which seems intuitively low and then the number of family members which while being ranked 5th for Unhappy, is ranked interesting 1st for Happy. Thus, for those HH with a low quality of life it is apparently seen as having a low impact while for Happy ones it is ranked 1st. And finally, PLW.

But what about when there is more than one of these factors in a HH/family such as a large household, with children below 5 and PLW? To assist in that and also in the rapid setting up of targeting spreadsheets the analysis went one step further and derived weighting factors. These were based on dividing the anxiety factors for Unhappy and Happy and are listed in "Calculated Weighting Factors" in Table 5 above. The PWD factor was arbitrarily amended to produce the suggested factors and ranges given in "Suggested Weighting Factors". The importance of these is that they can be automatically incorporated into the Agency's existing data bases and consequent prioritization of affected families (if that is what is seen as being appropriate) can be readily achieved.

6. Case study 3: winterisation in Afghanistan

Table 8. Case study 3 data

Disaster:	Flooding in the North of Afghanistan April-May 2014.
P: Providing	The winter shelter
E: Enabling	To get as many families as possible through the winter from December 2014 to February 2015 by providing shelter assistance and associated non food items.
A: The capacity to be adaptive	Adapt strategies and resources to give a best fit for the identified "gap".
S: The capacity to sustain.	Sustainability through coordination, identification of the "gap" that frames the "problem".

Afghanistan is subjected to annual flooding following the winter thaw. However, the floods in the North of Afghanistan in April/May 2014 were more severe than usual, damaging villages that were more than 100 years old. The 17,864 affected families (125,000 people) was double the number in 2013. The rain also triggered a tragic mud slide in early May at Abi Barak in North Eastern Afghanistan. There were 155 deaths and 6,770 houses destroyed in the flooding (OCHA, 2014,1) and 159 and 700 respectively in the mud slide(OCHA, 2014, 2)

A reassessed of the data was completed in July/August as the initial assessment numbers were based on varying assessment forms but the initial number of completely destroyed houses was 8,164. That assessment created a Category A (CAT A) where the house was completely destroyed and there was at least one of the 7 stipulated vulnerability criteria namely (ES&NFI, 2014)

- Female head of household
- Elderly head of household
- Disabled head of household
- Very large family (8 members or more)
- Very low income
- Child head of household
- Other vulnerability (specify)

That re-assessment snap shot taken on 19 August 2014 showed that the CAT A numbers were 6,579 families, that 37 houses had been constructed and that there was funding for a further 904; hence there was a GAP of 5,638 families or houses. So what could be done?

Eleven different strategies were devised to both lower the 5,638 GAP and also increase the effectiveness of the 904 funded houses. When added up the GAP could be lowered from 5,638 to 3,972 while the funded could be increased by 500 houses. Hence the ideal GAP would be around 3,472 families (or houses). This was still very grim and hence estimates were made about the additional capacity of both the implementing partners and agencies as well as the perceived capability of the building industry in Northern Afghanistan. That suggested there could be a further 1,000 houses that could be constructed if additional funding were available. Hence, assuming an ideal response and cost saving and the optimum additional funding suggested that there would still remain a GAP of around 2,500 families (or 17,500 people) with no house and 1 of the 7 vulnerability criteria was hardly sustainable by any design nor palatable to agencies seeking to assist. This was all against a timeline of 93 days for September, October and November with winter snows and sub zero temperatures expected to start in December.

The final option left was if it was not possible to provide shelter was to provide a Cash for Fuel grant supplemented with a family kit that included clothes and blankets.

7. Discussion

Firstly, it was noteworthy that the PEAS Approach (Hamdi 2010) though simple appears to get to the point quickly. The basic logic of connecting what is Provided, to what it Enables, and to how that is Adapted and finally Sustainability works well. And should/could be readily used and adopted in the field.

But the case studies underline the difference and significance that a SbD approach, over a solely sustainability framework. Such frameworks would be deficient in the above case studies. The first in Port au Prince showed how connecting to the social patterns happening both inside the house and inside the neighbourhood produced a house of "value". And that value (beyond the asset value of the house) would mean a sustainable outcome. The second highlights how the SbD using a QoL tool was able to confirm the selection of a sustainable material that could support family shelter from the emergency phase and beyond. Again, this would not be achievable with the conventional framework. The third case study highlights how coordination and a standard gap analysis allowed review of multiple strategies to determine a sustainable outcome.

The three case studies used different SbD approaches that allowed the "doing of something today". They also allowed the consideration of the "how" question and were "explanatory and descriptive" about the potential of a SbD approach in shelter in post disaster reconstruction. The causal link to "support tomorrow's generation" can be sensed but probably only time will tell to what extent.

8. Conclusion

SbD approaches seem to achieve more effective sustainable shelter outcomes in post disaster reconstruction. It appears to be complicated and complex in nature but certainly holistic and integrated. It seems to require an elevated engagement with the affected community and while it can have a technical foundation appears to require a professional expertise that incorporates a broad human perspective and understanding.

References

Alexander, C., Ishikawa, S., Silverstein, M., Jacobson, M., Fiksdahl-King, I. and Angel, S. (1977). *A Pattern Language*. New York: Oxford University Press.

Brand, S. (1994). *How Buildings Learn: What Happens After They're Built*. New York: Viking.

Cooper C. (1995). *House as a Mirror of Self. Exploring the Deeper Meaning of Home*. California: Conari Press.

Psychology Foundation of Australia. (2006). *Depression Anxiety Stress Scales (DASS)*. Retrieved Augustu 2014, from http://www.psy.unsw.edu.au/Groups/Dass

Emergency Shelter and Non Food Items Cluster: Shelter Guidelines 2014. (2014). Somalia: UN-OCHA ES&NFI.

Groat, L.N., Wang, D. (2002). *Architectural Research Methods*. New York: J. Wiley.

Hamdi, N. (2010). *The Placemaker's Guide to Building Community*. London: Earthscan.

IFRC [ifrc]. (2014). *The Shelter Effect* [Video file]. Retrieved August 2014, from https://www.youtube.com/watch?v=Lf2z38u2djA

Jacobson, M., Silverstein, M., Winslow, B. (2002). *Patterns of Home: The Ten Essentials of Enduring Design*. Newtown, CT: Taunton.

Lovibond, S. H., and Lovibond, P.F. (1995). *Manual for the Depression Anxiety Stress Scales*. Sydney, N.S.W.: Psychology Foundation of Australia.

UN-OCHA. (2014, May 22). *Afghanistan Flash Floods Situation Report No. 8 as of 1800h (local time) on 22 May 2014*. Retrieved from http://reliefweb.int/report/afghanistan/afghanistan-flash-floods-situation-report-no-8-1800h-local-time-22-may-2014

UN-OCHA. (2014, May 3). *Afghanistan Flash Floods Situation Report No. 4 as of 1800h (local time) on 03 May 2014*. Retrieved from http://reliefweb.int/report/afghanistan/afghanistan-flash-floods-situation-report-no-4-1800h-local-time-03-may-2014

PASSA: Participatory Approach for Safe Shelter Awareness. (2011). Geneva: International Federation of Red Cross and Red Crescent Societies (IFRC).

Potangaroa R. (2008, June). *Talk to the Buildings*. Paper presented at The Central South University Research Seminar, Changsha, China.

QSAND : Quantifying Sustainability in the Aftermath of Natural Disasters). (2014). BRE Global Limited in conjunction with The International Federation of the Red Cross and Red Crescent Societies (IFRC).

Humanitarian crisis. (n.d.) Retrieved August, 2014 from http://en.wikipedia.org/wiki/Humanitarian_crisis

2010 Haiti earthquake. (n.d.) Retrieved February, 2014 from http://en.wikipedia.org/wiki/2010_Haiti_earthquake

Yin, R. K. (1994). *Case Study Research: Design and Methods*. Thousand Oaks: Sage Publications.