

## AN ANALYSIS OF AN INTERNATIONAL NGOS DESIGN DECISION-MAKING IN POST DISASTER DEVELOPING COUNTRY CONTEXT A Sri Lanka Case Study

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### Abstract

*The purpose of this paper is to explore the current design and delivery approaches of a selected INGO operating in the field of post disaster housing design and delivery in developing country contexts and clearly map out their approach from inception to completion of a housing project. The research utilizes a case study analysis involving a leading European INGO operating in post disaster housing delivery in Sri Lanka in the aftermath of the 2004 Indian Ocean tsunami. The research highlights the main challenges and opportunities in relation to the design and delivery of low cost sustainable housing in developing countries as identified in current literature on the subject. An in depth analysis of the selected INGO's overall design and delivery approach was undertaken utilizing a causal mapping interview procedure with lead designers within the organization who were involved in the project's design and implementation. The results identify and discuss the specific approaches, challenges and considerations that informed their decision-making as an INGO in a post disaster developing country context which. The results of this research study provide a concise insight into the design decision-making process and considerations of leading foreign INGO's operating in developing countries and will be beneficial to policy makers, NGOs, government bodies and community organizations in practice as it offers unique evidence based insights into an international bodies housing design decision-making process.*

**Keywords:** Sustainable housing; developing countries; decision-making; knowledge transfer.

### INTRODUCTION

The frequency and devastation of natural disasters are becoming more common and extreme in recent decades worldwide. Many developing countries are innately more vulnerable to natural disasters and have experienced disproportionate levels of devastation as a result of disasters resulting in large numbers of displaced populations in many developing countries throughout the world (IFRC 2001, Schilderman 2004) This vulnerability is often caused by common issues which are experienced in many developing countries including development in areas susceptible to natural disasters, unsettled governments, poor construction standards and techniques, insufficient resources and knowledge in post disaster recovery. The built environment is often worst effected by many natural disasters with housing often making up a large proportion of the damage resulting in large number of displaced populations in developing countries throughout the world.

The permanent reconstruction phase of recovery following disasters can be viewed as an opportunity to build back better and offers the opportunity to governmental bodies and

implementing agencies to undertake a holistic approach to ensure sustainable long-term solutions for affected populations. Opportunities to strengthen local capacity in relation to future disasters, livelihood generation, equity and quality of life can be capitalised on through the use of appropriate design solutions and implementation which is sensitive to the local context. This is no more so relevant then in relation to post disaster housing reconstruction given the impact dwellings can have on the everyday lives and wellbeing of their inhabitants. As such appropriate and sustainable post disaster housing design and delivery is essential to ensure the successful long-term sustainable return to normality for affected communities.

Many design and planning professionals have a poor understanding of the effects of their designs in post disaster housing contexts (Salazer 1994). Many current approaches to post disaster housing view the dwelling as a mere product or output and this often results in inappropriate repetitive constructions and typologies which ironically can have adverse effects on the end users long-term needs and wellbeing in terms of environmental, social, cultural and economic development. Many approaches rely on the manufacture and import of many of the materials used which result in houses that are not affordable for the masses of population that require them (Adeyemi 2002) as well as being environmentally unsustainable. Current approaches employed are often associated with developed countries and many developing countries race to imitate them in post disaster housing often due to the effects of globalisation and the perceived affluence and prosperity of the western developed countries. This approach lack any clear understanding of sustainable development by the decision makers involved and often has resulting detrimental social, cultural and environmental effects on the communities it serves.

The design and delivery of affordable and sustainable post disaster housing is a complex multifaceted approach involving many relevant stakeholders and diverse considerations on aspects including social, environmental, cultural and economic sustainability (UNDRO 1982).

*“A house is merely the end product of a long chain of social, economic, technological, environmental, political and other interactions” (UNDRO 1982 piii).*

Many developing country governments lack the capacities to adequately design and implement appropriate housing, particularly in a post disaster context when additional pressure of the need for immediate shelter often are given priority over long-term sustainable solutions. This, coupled with vast influxes of internal aid in the immediate aftermath of natural disasters, has often resulted in governments looking to external international assistance and expertise in relation to post disaster reconstruction. This assistance is often in the form on international non-governmental organizations (INGOs). However international assistance does not automatically imply successful outcomes in relation to post disaster housing. Many INGOs have also lacked the expertise and strategies in relation to the effective design and delivery of post disaster housing and further compounded the devastating effects of the disaster. INGOs often face additional challenges in that they are foreign to the context they are working in and this has resulted in many introducing inappropriate design solutions which do not cater for the beneficiaries' long-term needs. This is often as a result of time and resource pressure in a post disaster context as well as insufficient knowledge of the local context in terms of its social, cultural, economic and environmental makeup.

Improved approaches to the design and delivery of post disaster housing in developing countries are required now more than ever. If designers and decision makers are to play an integral role in providing affordable and sustainable post disaster housing solutions they need aspects such as affordability, sustainability and knowledge of the norms, codes and values of the society they are working in to be high up the agenda in their decision-making process. INGO's responsible for the design and delivery of post disaster housing have a responsibility to ensure context specific, sustainable and appropriate design approaches that enable communication, participation and empowerment of the communities they are working within. INGOs involved in

post disaster housing provision also face a number of additional challenges as they must remain loyal to their core principles of empowerment and community involvement while preserving independence from the many different external organizations which may exert influence on them such as donors and local governments. To achieve this they must insure they have the correct protocols and approaches which ensure that design decision-making is fully informed and catered to the people and community it serves. Access to relevant information and knowledge transfer are essential for the designer to obtain.

### **Design Decision-making**

Harrison (1999) defines a decision as,

*“a moment in an on-going process of evaluating alternatives for meeting an objective, at which expectations about a particular course of action impel the decision maker to select that course of action most likely to result in attaining the objective”.*

Human performance in decision-making has been the topic of research from a number of different perspectives. From a psychological perspective, it is necessary to examine individual decisions in the context of a set of needs, preferences an individual has and values they seek. From a cognitive perspective, the decision-making process must be regarded as a continuous process integrated in the interaction with the environment. From a normative perspective, the analysis of individual decisions is concerned with the logic of decision-making and rationality and the invariant choice it leads to (Kahneman & Tversky, 2000).

Different professions refer to decision-making differently i.e. architecture may refer to decision-making as design (Simon 1977). All architects and engineers as designers and project managers, make many decisions on a daily basis in relation to their work. The process of designing reconstruction projects, infrastructure, public space, etc involves many decisions to be taken on many different levels. On a very simple level a typical design process involves 3 main stages (Cuff 1991):

- Initial concept stage.
- Design development (problem solving stage).
- Working drawing/implementation phase.

As every project is unique these 3 basic main stages may vary from project to project. However regardless of what stage a project is at or what context it is located in, design decisions, like all decisions, are based on some rational or logic as well as been conducted in the context of that particular project (Holm, 2006). Logical decision-making is an important part of all science-based professions within which architects and engineers are deemed to exist, where specialists apply their knowledge in a given area to making informed decisions. Professional decision-making is often seen as being the skilful application of technical knowledge within ethical limitations (Holm 2006).

However architects and engineers, working within INGO's in post disaster contexts often face unique challenge in relation to the design decision-making process in reconstruction projects due to the unique circumstances and contexts that they are operate in the aftermath of disasters. Much research to date (Fallahi, 2007, Pugh, 1994, Randolph *et al.*, 2008) has demonstrated that the design responses after many disasters leaves much to be desired in terms of appropriate long-term sustainable design responses that best serve the needs of those displaced. As such the need for a clear understanding of the design decision-making process of the various actors within INGO's is required now more than ever to inform future work within this field.

## FOCUS OF THE PAPER

The purpose of this research is to gain an in-depth understanding of the design approach, decision-making and project protocols of a leading European NGO operating in the field of post disaster reconstruction and housing worldwide. The study identifies the main design considerations, challenges, objectives, strategies and solutions undertaken within the organisations design and delivery approach and discusses their rationale in detail. The detailed findings and understanding of the organisations approach to post disaster housing are further established with the formation of a graphical sequential chart clearly based on the data and analysis undertaken.

## METHODOLOGY

This paper examines a leading European NGO's designers and project managers as part of a case study analysis in relation to the design and delivery of post disaster housing in developing country contexts. Yin (1994) describes case study research as follows:

*"A case study is an empirical inquiry that investigates a contemporary phenomenon within its real life context, especially when the boundaries between phenomenon are not clearly evident"*

The research was exploratory in nature and utilised a variety of data sources which resulted in multiple sources of evidence including interviews, archival data and empirical field data. Appropriate analysis techniques including decision analysis utilising Banxia Decision Explorer were utilised to complement the various data gathered from the various sources to provide the findings and conclusions of the research.

### Scoping Study

An extensive scoping study review was undertaken as part of the overall research to identify the main barriers and drivers for affordable and sustainable housing design in post disaster developing country contexts. Bruen et. al (2013) highlight the main findings of this study. This approach was deemed appropriate to this research area given the numerous sources of information available from various organizations and bodies i.e. academic journals, industry journals, international housing organisations, non-governmental organisations (NGO's) etc. In-depth and broad findings on the topic were sought from current available literature to enable conclusions and findings to be established to inform the current research on the subject.

### INGO Profile

The selected INGO from this research wished to remain anonymous. Although this paper specifically looks at 1 NGO, it fits into a research framework as part of a wider study focusing on multiple disasters and multiple INGOs. The selected INGO for this study is European based and in operation for over 35 years in urban and rural post disaster contexts in developing countries worldwide. To date the organisation has operated in housing design and delivery, in both post disaster and general housing, in numerous countries and regions worldwide contributing to significant knowledge accumulations. Geographical experience includes: Cameroon, Ethiopia, Kenya, Lesotho, South Africa, Tanzania, Afghanistan, Bhutan, India, Indonesia, Laos, Nepal, Pakistan, Philippines, Sri Lanka, and Vietnam, Brazil, Cuba, Guatemala, Honduras, Nicaragua, Azerbaijan, Bosnia, Czech Republic, Kyrgyzstan, Tajikistan, Ukraine, Egypt and Palestine. The organisation has a mandate to fight poverty and support to the livelihoods of disadvantaged and marginalised people through collaboration with partners from all continents.

The organisation works in a multi-disciplinary, integrated and participatory way and applies its knowledge through collaboration with local partners from all continents in the design and implementation of a large variety of projects. The organisation advocates working in an integrated manner in order to achieve affordable and sustainable solutions giving consideration to

aspects such as technical, environmental, economic social/cultural and institutional aspects and how they may impact on design in a local context. Planning, design and implementation of projects are undertaken through a participatory approach that includes the perceptions of all stakeholders. An integral part is the socio- economic aspect of building activities, whereby the needs of the poor and most vulnerable are addressed with regard to employment opportunities and affordable housing.

### **Exploratory Interviews**

Unstructured interviews were conducted with 3 senior designers and project managers operating in the field of post disaster housing in developing country contexts. It was essential to ensure that the experience of the selected staff was sufficient and they had demonstrable hands on field experience to further enrich the research (Table 1).

Table 1: Profile of interviewees from selected INGO (Source: Authors).

	Position	Years of experience in housing design and delivery in post disaster developing country contexts
Interviewee 1	Architect, Planner and Project Manager (head of settlements department)	25+
Interviewee 2	Architect and Urban Planner (sustainability specialist)	10+
Interviewee 3	Project Manager (knowledge Management specialist.)	10+

Due to the exploratory nature of the research unstructured interviews were deemed to be the most appropriate. No standardised questions were prepared but key findings from the scoping study were utilised to direct the conversation around key themes in the organisations approach to post disaster housing design and delivery. Questions were asked in a manner that worked best with Decision Explorer i.e. how, why, who, when etc in order to establish information on the organisations approach in terms of objectives, strategies, barriers faced, outcomes etc. and also to enable the interviewee to speak freely and obtain the interviewees explicit and tacit knowledge in relation to the subject. Where required, follow up questions were used to clarify any unclear or ambiguous information.

The interviews were conducted at the organisations European headquarters and recorded, with the interviewee’s permission, to be mapped out utilising Banxia Decision explorer. The interviewees were asked to speak openly of their experiences in various countries worldwide and the design and delivery of the organisations approach from inception to completion. For the purpose of this study one particular post disaster case study was selected to focus on in in-depth detail in order to provide context to the study. The selected case study this research study relates to is a 100 dwelling post disaster coastal housing reconstruction project in Sri Lanka following the Asian Tsunami in 2004 which caused catastrophic damage to the coastline of Sri Lanka (fig 1). The primary author undertook field research in the form of post occupancy evaluations and inhabitant interviews on the selected case study as part of wider study focusing on multiple disasters and multiple INGOs.

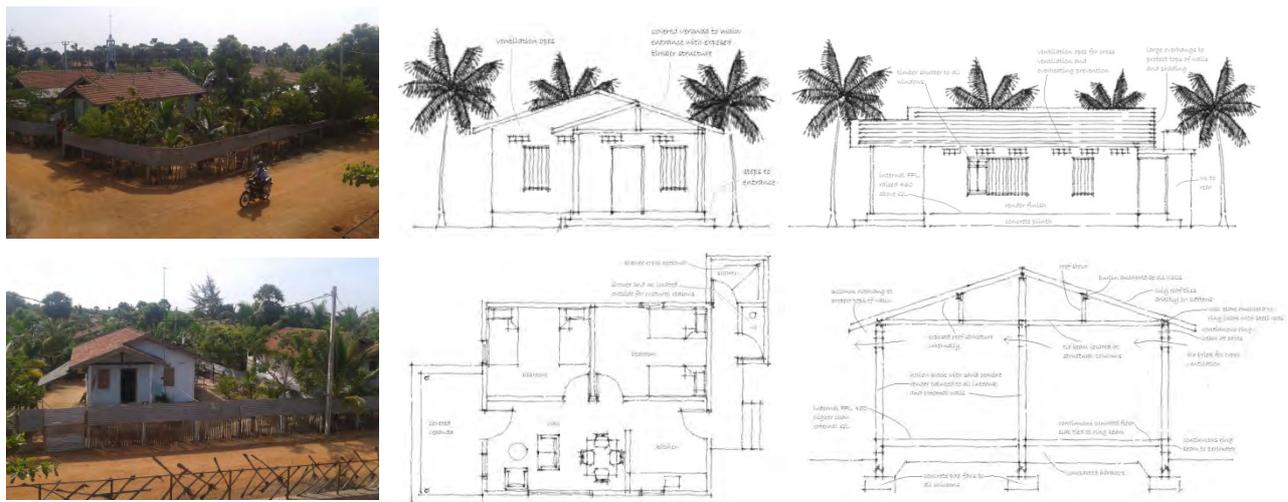


Figure 1: Pictures and field notes of Sri Lanka case study (Source: Authors).

The use of unstructured interviews enabled additional findings beyond that of the scoping study that would have perhaps been missed out had an alternative more structured approach being utilised for data collection. The ability to elicit expert's experiences, design considerations and overall approaches to post disaster housing design and delivery enables an overall picture to be developed of the organisation design and delivery approach to post disaster housing.

### Cognitive Mapping and Decision-making

The main objective of this piece of research is to obtain the designers and organisations representation/cognitions in relation to the design and delivery of post disaster housing in developing country contexts. As such it was decided to undertake further analysis of the interviews through the use of cognitive mapping. Cognitive mapping is a form of empirical research that uses a theoretical and methodological approach that contends that cognitive maps represent the interviewees' causal knowledge (Hurby 2006). Fiol & Huff (1992) define cognitive maps as graphic or visual representation of thought or sense making that locate people in relation to their information environments and can be linked to decision-making. Bryson et. al. (2004) refers to causal mapping as the complex causes and consequences of every issue we encounter.

For the purpose of this study an event mapping procedure was utilised to reconstruct a post disaster housing project from inception to completion with all the associated linkages along the journey. This approach is a hybrid of both cognitive and causal mapping techniques and is utilised to develop an in-depth picture of the project cycle and the key considerations that informed decision-making along the way as well as barriers and challenges faced, objectives set, strategies employed and outcomes. The maps are used to gain an insight into the nature of the cognitive process of architects and project managers in relation to post disaster housing design and delivery. It is not intended to try and map the interviewee's entire thinking but rather to provide a wider context of the environment in which the interviewee operates and how these representations and considerations are formed.

Individual maps were constructed for each individual interview. To further develop an understanding of the overall organisations approach all 3 individual maps were merged in to one global map representing the overall organisations design and delivery approach to post disaster housing projects in developing country contexts. This resulted in a global map with 212 individual identified concepts (fig 2). To further investigate the results, the interview maps were entered into a software package called Banxia Decision Explorer. This software package enables a more detailed and reliable analysis to be undertaken and enabled the maps from the individual interviews to be merged to enable an overall analysis to be undertaken.

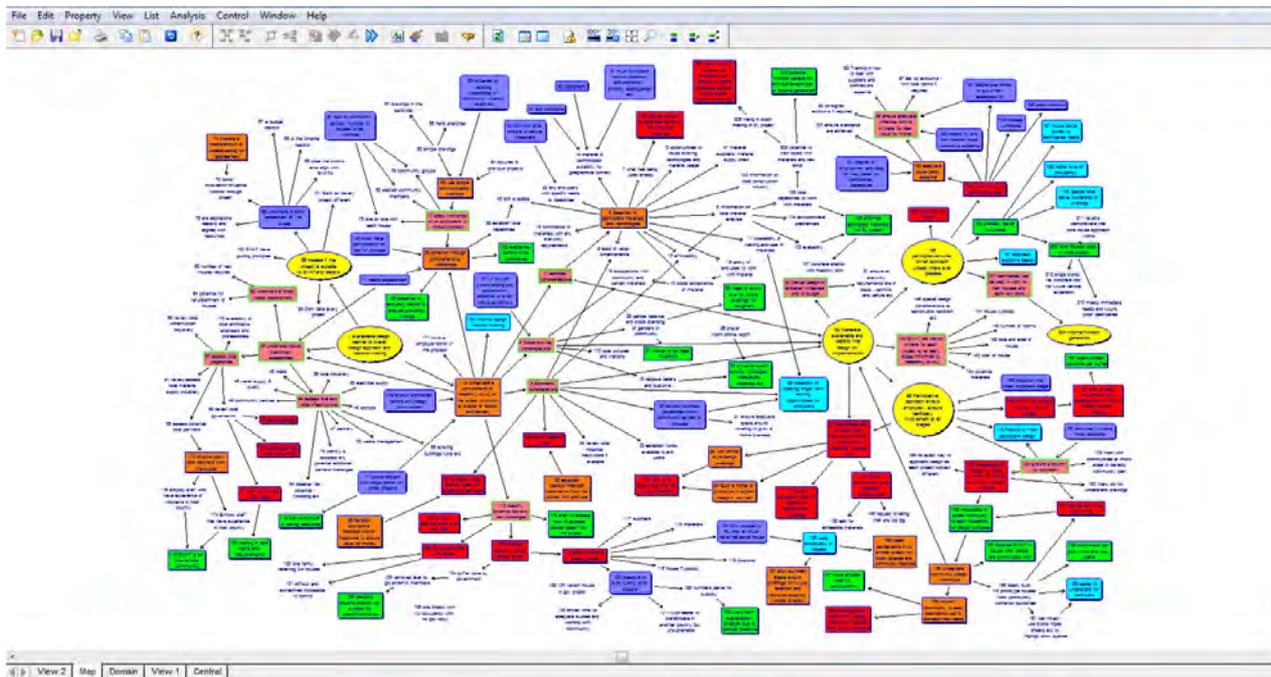


Figure 2: Screen shot global map on Decision Explorer (non-legible text for demonstration purposes only) (Source: Authors).

Additional documentary data as well as a site visit and interviews with the dwelling inhabitants by the author was also undertaken for the case study in question as part of a larger research framework focusing on multiple disasters and multiple INGOs. This additional information provided more context for the case study in question and was also utilised to provide secondary information for this paper. This secondary data combined with the analysed data from this paper were utilised to formulate a sequential graphical flow chart demonstrating the organisations approach to post disaster housing projects in developing countries highlighting the main stages in the process and the main design and delivery decision-making consideration at each stage of the process. Figure 3 highlights the overall methodology for this paper.

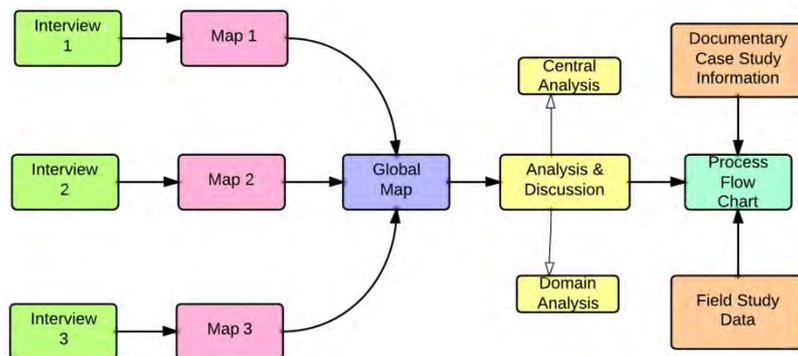


Figure 3: Methodology Design (Source: Authors).

The Decision Explorer software is a proven tool for managing "soft" issues - the qualitative information that surrounds complex or uncertain situations and decision-making. It allows you to

capture in detail thoughts and ideas, to explore them, enabling new understanding and insight to be gained. The advantages of using cognitive mapping and Decision Explorer include: (Eden & Ackermann 1998):

- Understanding the central themes, key issues and activities.
- Visualisation of complex issues and lines of reasoning.
- Capacity to process complex data.
- Minimisation of risk of researcher bias.
- Ease of traceability and verification of results.
- Provision of simplified graphical information for individuals and organisations.
- Process is not constrained by a formal structure.

Banxia Decision Explorer enables several different analysis techniques to be carried out on the maps. These enable the extraction of critical concepts and links from the global map which are identified and discussed in detail. For the purpose of this study it was decided to use the Domain and Central analysis to identify the most important concepts and their implications as identified from the global map.

### Central Analysis

The central analysis identifies the importance of each concept in relation to the wider group of concepts and not only the neighbouring ones. It is an indication of the importance and influence of a concept within the overall map. Higher scoring concepts in the central analysis have more multi-layered networks associated with them and highlight the significance of that concept and its wider implications. The top 10 identified concepts from the central analysis are discussed in detail.

### Domain Analysis

The domain analysis is used to identify those concepts that have many links to and from them. This indicates that the concept has been expanded upon a lot during the interview. It establishes linkages with other concepts in its immediate domain. The analysis indicates the richness of meaning of each individual issue but only calculates local complexity and completely ignores the wider context of the issues. However the Domain analysis is more easily influenced by personal bias than central analysis and as such it used in conjunction with the central analysis to give a more balanced view of the important concepts in the map.

## FINDINGS AND DISCUSSION

The top 10 identified concepts from both the central and domain analysis are extracted and discussed in detail. Following this discussion a detailed graphical overview is formulated from the data and analysis to demonstrate the organisations approach to a post disaster housing project in a developing country context.

### Central Analysis

Table 2. Top 10 scoring concepts from Central analysis of global map (Source: Authors).

Rank	Concept	Category
1	Undertake comprehensive feasibility study at the outset to inform all stages of design and delivery.	Solution
2	Generate sustainable and realistic final design for implementation.	Objective

3	Economic considerations	Strategy/Approach
4	Technical considerations	Strategy/Approach
5	Social/cultural considerations	Strategy/Approach
6	Undertake robust preliminary assessment	Strategy/Approach
7	Achieved through a comprehensive workshop	Solution
8	Selection of appropriate materials and technology	Solution
9	Participative/owner driven approach utilised wherever possible.	Objective
10	Sustainable design central to overall design approach and decision-making	Objective

### Solutions

There are 3 solutions that appear in the top ten central concepts. Ranked at number one, "Undertake comprehensive feasibility study at the outset to inform all stages of design and delivery," highlights the central importance placed by the organisation on feasibility studies at the outset in relation to how it informs its design decision-making and delivery throughout all stages of the project. Highlighted within this process was the need to involve the donor and beneficiaries in the feasibility process from the outset and that the process must always be undertaken prior to commencing design.

Out of this central concept are a number of other solution concepts which are ranked within the top ten concepts of the global map. "Achieved through a comprehensive workshop" ranks at number seven and highlights the organisations participative approach in relation to obtaining a comprehensive feasibility study at the outset. Again the need for participation in the process is highlighted as well as the need to accurately record and interpret its findings. This is a process the organisation believes it has strong competencies in following over 30 years of experience and the relevant personnel in knowledge management and knowledge transfer available to undertake it accompanied by field specialists.

The benefits of the workshop approach are highlighted as enabling the organisation to establish local capabilities in a number of areas and also enable key factors to be considered at design stage. The organisation employ a number of different workshop process which vary from project to project depending on context, local community dynamics, size of community, number of houses, literacy levels etc. Key to the workshop process is the ability to adapt a workshop and participative process within the project parameters and constraints to ensure beneficiary's requirements are met and their knowledge obtained and utilised within the overall process. To achieve this, the organisation employs various techniques with effective communication central to all. Depending on context these include one on one consultation, election of community representatives or groups in larger communities where time or finances do not permit one on one consultation. The interviewees believed that key to a successful workshop is the ability to use simple communication methods suitable to the community been served. This may involve simple hand drawings, sketches, models etc.

"Selection of appropriate materials and technology" ranked eighth in the top ten concepts and highlights the importance placed on this aspect of design by the organisation. The design decisions in relation to the use of appropriate materials and technology are informed from research from the design and feasibility workshops as well as knowledge from previous projects in similar contexts. The organisation gives a large variety of aspects consideration in relation to selection of materials ranging from technical, social, economic and environmental aspects i.e. performance, statutory requirements, maintenance and repair aspects, skilled workforce available or ability to train a workforce, supply chain, logistics in using material, potential for training and

entrepreneurial spin out, social perception, health aspects, green credentials, longevity, appearance and affordability. The organisations approach demonstrates that appropriate material and technology use is central to them achieving the overall objectives and as such the believe it is essential to afford it adequate time and resources to ensure decision-making is fully informed at all stages.

### **Objectives**

Three objectives were highlighted within the top ten concepts and this highlights that the organisation has clear objectives at the outset and the central importance placed on achieving these as part of the overall design decision-making process. "Generate sustainable and realistic final design for implementation" is highly ranked at number two and this reflects the organisations overall ethos in relation to all its work. Emphasis was placed on the use of the word realistic by the interviewees as very important as the organisation believes it is all too easy to talk about sustainability and propose various approaches and technologies which have little basis in the real life context in which they are to be implemented. The interviewees highlighted that delivery of the project in the allocated time and budget is central to this concept. The organisation believes it is essential for them to achieve both time and budget goals for the beneficiaries' sake and their own reputation and future work. As such they believe the initial feasibility study is imperative in obtaining this key objective for the organisation as it enables them to set project specific criteria and parameters early in the design process in order to manage the design and delivery process through all stages and mitigate against greater risk of failure in one or more areas.

The interviews highlighted that convincing beneficiaries or donors of their proposed long-term solution was one of the main challenges in realising this objective. Issues with perception of certain building materials i.e. earth, certain building typologies and beneficiaries unrealistic expectations i.e. large house sizes and unfeasible materials, were highlighted as common challenges which had to be overcome. The organisation often resorted to constructing prototype dwellings or visiting similar dwellings if possible and educating the beneficiaries and donors of the merit of their approach where required. However it was stated that this was time and cost consuming and not always feasible on every project and as such is very project specific.

"Participative/owner driven approach utilised wherever possible" which is ranked at number nine is again another key objective the organisation set for each and every project and believe it is essential in order to obtain the most appropriate final outcome for the beneficiaries. This applies to all stages of the project from inception to completion. The organisation believe key to obtaining this is a bottom up approach working at both a macro and micro scale with the community to ensure that all decisions are made by or with agreement of the community as much as possible.

"Sustainable design central to overall design approach and decision-making" is ranked at number 10 in the overall concepts and this demonstrates the importance of this objective in informing and driving the organisations overall approach to design decision-making and delivery of its work. As such the drive to achieve this key objective is the seed for many other top ten concepts. The interviewees highlight that they undertake an assessment at the outset of every project when approached in order to assess if the project is suitable for them as adherence to their key objectives and guiding principles are central in their decision whether to undertake a project or not.

This process involves undertaking a donor and project requirements assessment which involves analysing aspects such as budget and time resources, donor aspirations and ethos i.e. does it align with the organisations, donor involvement/influence on design and delivery process etc. Should the project be favourable to all parties the organisation prepare a Memorandum of Understanding (MoU) which highlights what they are appointed to undertake and the manner in which it will be undertaken. This forms part of the organisations appointment to a project and is used to ensure all parties are clear from the outset of the projects deliverables and guiding principles.

### **Strategy/Approach**

Strategies and approaches in design decision-making featured strongly in the top ten concepts. Economic, technical and social/cultural considerations were ranked third, fourth and fifth respectively. This highlights the organisations central emphasis on a holistic approach to sustainability as each concept can be viewed as a key pillar of any sustainable model and as such are often interrelated in many ways when it comes to design decision-making. Economic considerations highlighted that influence the design and delivery process include assessing the funding available and affordability of the final designed dwelling and ensuring that both are aligned and realistic. This was highlighted as a challenge as often project budgets and client aspirations are not aligned and need to be addressed from an early stage.

The expenditure of donor money on other essentials not involving their dwelling was highlighted as a common problem area, particularly after natural disasters and conflict where essentials such as food and clothing are often higher up beneficiaries priority list. As such the organisation set strict economic constraints and controls of budgets are set at an early stage in each project. The long-term economical sustainability was highlighted as vital in informing the decision-making process and aspects such as material selection i.e. affordability, maintenance and repair costs etc. The potential of livelihood generation was also highlighted as a key consideration in design decision-making. The organisation actively explore if possibilities of training and potential start up business are possible as part of the design/implementation process to facilitate a legacy of potential business and livelihood generation when the project is complete. This can inform design decision-making in unusual ways such as material and technology choice and aspects such as plot layout to ensure future space of business growth.

Technical decisions were highlighted as central to the design process and cover various aspects and are closely related to and informed by the use of appropriate materials and technology as outlined above. The interviewees highlighted that technical decisions cannot be considered in isolation and must be assessed in relation to economic, environmental and social/cultural criteria at all stages. The interviewees highlighted that a robust analysis of local capabilities and feasible materials is essential to inform this aspect of design and decisions are often made on a tripartite assessment of the social/cultural, economic and environmental aspects of a particular technical element of the design be it materials, technology, house typology etc. to arrive at a final balanced decision in the best interest of the beneficiary.

All interviewees considered social and cultural aspects of the design decision-making process of the utmost importance. It was highlighted that Sri Lanka had a diverse religious and cultural heritage, as do many countries, and aspects such as religious beliefs, customs and tradition must be given due attention throughout the dwelling design and delivery process. Aspects including prayer/shrine rooms as well as various gender roles were highlighted as been of importance in relation to housing layout and how the project was implemented.

“Undertake robust preliminary assessment” was ranked 6 and highlights the need to undertake a broad holistic overview of the project at the outset even before commencing detailed workshops with the beneficiaries. The interviewees highlighted the preliminary assessment is more macro in scale and includes an assessment of the site and local infrastructure i.e. roads, local construction industry, utilities supplies (water, electric, sewer, waste management), schools, shops, community centres etc. A review of local capabilities in relation to potential partners is also undertaken i.e. architects, engineers, suppliers etc. The organisation highlighted that they employ many nationalities and see themselves as an international community and actively recruit qualified staff who are either from or have worked in the host country in order to develop local contacts or obtain access to local knowledge. This they feel is something that has contributed to their successful completion of many projects throughout the world.

## Domain Analysis

Table 3. Top 10 concepts from domain analysis of global map (Source: Authors).

Links	Concept	Category
15	Selection of appropriate materials and technology	Solution
12	Assess site and local infrastructure	Strategy/Approach
11	Economic considerations	Strategy/Approach
11	Undertake comprehensive feasibility study at the outset to inform all stages of design and delivery.	Solution
9	Generate sustainable and realistic final design for implementation.	Objective
8	Social and cultural considerations	Strategy/Approach
8	Achieved through comprehensive workshops	Solution
7	Some decisions already made	Challenge/Barrier
7	Skat set certain criteria for each project at an early stage (informed by feasibility study)	Strategy/Approach
6	Participative approach always employed – ensure beneficiary involvement at all stages.	Objective

### Solution

A total of 3 solution concepts appear in the domain analysis top ten. Of these all three, “Selection of appropriate materials and technology” (15 links), “Undertake comprehensive feasibility study at the outset to inform all stages of design and delivery” (12 links) and “Achieved through comprehensive workshops” (8 links) also appear in the top ten central analysis concepts. This highlights that not only are these concepts central to the organisations design decision-making approach but they also were discussed in interview as been particularly vital.

### Strategy/Approach

A total of 4 Strategy/approach concepts appear in the domain analysis top 10. Of these 2 concepts, “Economic considerations” (11 links) and “Social and cultural considerations” (8 links) appear in the central analysis top ten concepts again highlighting their vital role in helping the organisation to achieve its overall objectives. “Assess site and local infrastructure” (12 links) is highly rated within the domain analysis. This was discussed at length by all interviewees as a full understanding of the local context; physical, geographical, social/cultural, economic and political was essential at the outset.

This strategy/approach formed part of the initial preliminary assessment and is undertaken on all projects to identify any potential challenges or barriers and opportunities and help establish a framework and parameters to move forward with on the project. This was highlighted as been of particular importance in post disaster contexts in relation to risk identification and mitigation of future risks. “set certain criteria for each project at an early stage (7 links) also featured highly throughout the interviews. This was highlighted as a key task to undertake at an early stage in relation to the design and delivery of the project as informed parameters had to be set to work within in order to maintain adequate management of the overall process.

### **Objectives**

2 objective concepts, “Generate sustainable and realistic final design for implementation” (9 links) and “Participative approach always employed – ensure beneficiary involvement at all stages” (6 links) were identified within the top ten domain analysis concepts. Both concepts appear in the central analysis and were previously discussed in detail. Both objectives are central to the organisations ethos and overall approach to design and hence referred to on a number of occasions throughout the interviews as much of their approach can be traced back to these central concepts as their driver. As such they can be viewed as critical success factors which the organisation consider central to the success of their design approach and implementation.

### **Challenge/Barrier**

“Some decisions already made” (7 links) is the only challenge/barrier concept to feature in the domain analysis top ten concepts. The interviewees stressed on a number of occasions the importance of initial stages of any project and the need to get a full overview of context and set project parameters from the outset. However on occasion the organisation is often asked to advise or take over a project after the initial stages are already completed by another party. This they feel can often have detrimental effects on the projects final outcome and long-term sustainability. Examples were given of certain decisions on aspects already been made by government bodies or at times donors i.e. house typology, suppliers and materials to be used, land zoning, time limits which can have detrimental effects on the final outcome or are short sighted and are often politically motivated or related back to political corruption, particularly after disasters, resulting in the full potential of the project not been realised. The interviewees highlighted that the beneficiaries are ultimately the ones who will face the consequences of this in the long run.

### **Process Flow Chart**

Following analysis of all interviews and additional documentary and empirical field research findings a process flow chart was formulated to demonstrate graphically the main stages in the organisations approach to post disaster housing reconstruction and the main aspects and considerations that informed decision at each stage (Fig 3). The organisations approach can be logically divided in to 4 main stages with each stage fundamental to the overall success of the project. These stages involved an initial stage prior to commencement to gauge if the organisation could work with the donor or funding body and if they had the capabilities to undertake the works. If the initial stage requirements were satisfied the organisation moved on to an intense research and feasibility stage which involved obtaining a thorough understanding of the local context and relevant stakeholders. The organisation highlighted stage 2 as paramount to undertake in sufficient detail as it informed the third design stage. Stage 3 design involves numerous workshops and participation from beneficiaries and relevant stakeholders. The final implementation stage covered more practical aspects of logistics and project management that were critical in order to deliver the organisation proposals in a challenging post disaster context.

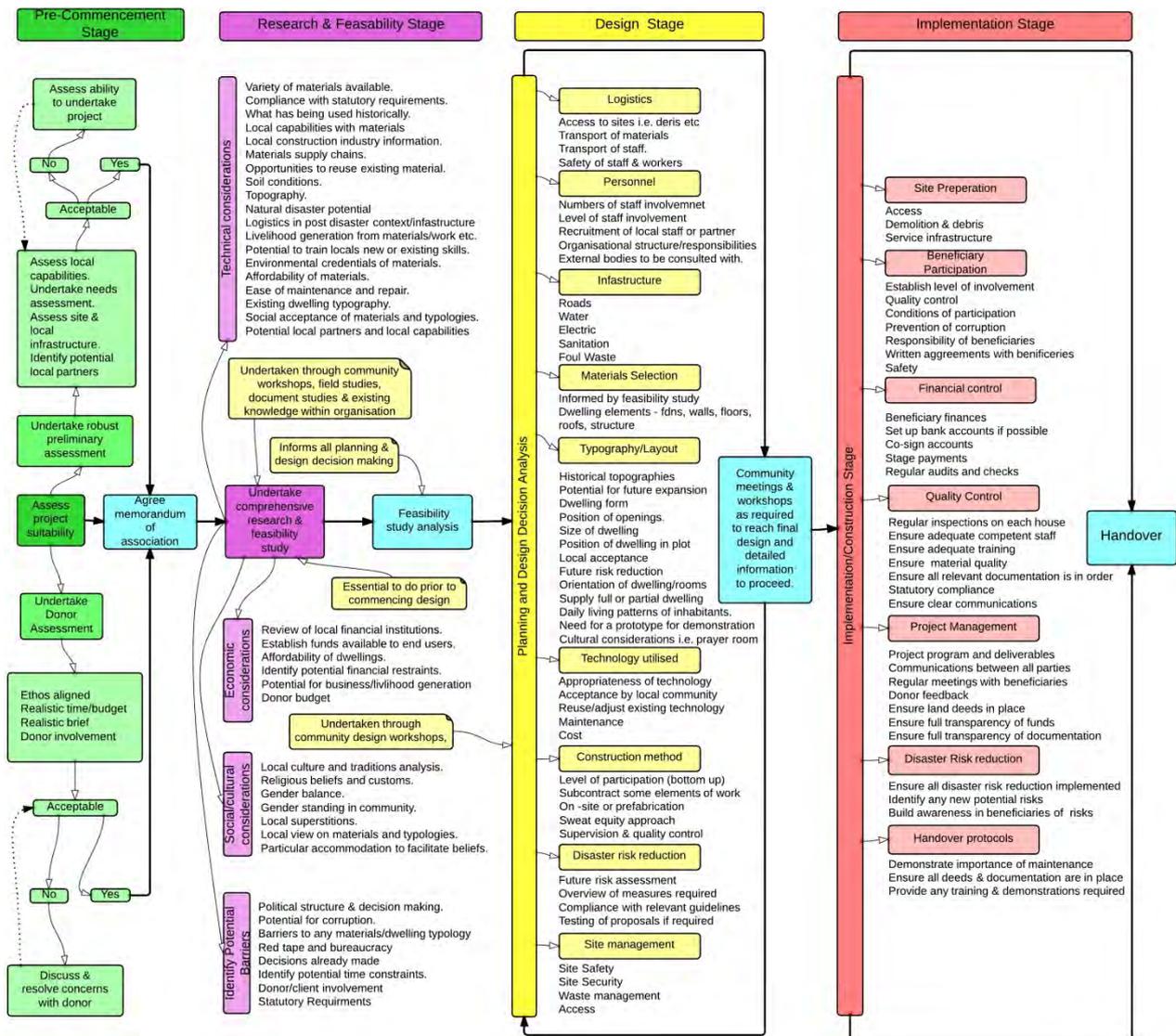


Figure 3: Process flow chart highlighting INGO's approach to housing design and delivery in post disaster contexts (Source: Authors).

**CONCLUSIONS**

This study involved a rigorous in depth study of an experienced INGO's approach to the design and delivery of affordable and sustainable post disaster housing in developing country contexts. The study offers valuable insights in to the challenges, barriers, objectives, strategies and drivers that an INGO faces in relation to housing design and delivery in a post disaster context. The research identified the aspects of design and project management which are central to the overall process and the emphasis placed on these at each stage of the process. Particularly evident was the organisations holistic approach to sustainable development and the means in which it identified the various elements of this and obtained relevant information on this aspect of the project and implemented it through a participatory approach at the various stages. Identification of potential barriers and challenges that were highlighted by the organisation as common when operating in a post disaster housing context are essential to identify and analyse from an early

stage in order to undertake adequate mitigation strategies so as not to impact on the quality of the overall project.

The identification of and separation of the main stages of the organisations approach in to a simplified flow chart enables a clear understanding of the organisations decisions making process in relation to design and project management. This study demonstrates the methodical approach a leading INGO employs for affordable and sustainable housing design and delivery in challenging post disaster contexts and its findings will be of benefit to policy makers, NGOs, government bodies and community organisations in practice as it offers unique evidence based insights into an international bodies housing design decision-making process. The study highlights the importance of appropriate design coupled with adequate project management in order to meet the long-term needs of effected communities in relation to post disaster housing.

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