Defining Flexible Standards for Post-Disaster Emergency Sheltering

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Abstract

Post-disaster emergency-sheltering requires that various relief agencies and other actors with different backgrounds cooperate in a tremendously short amount of time and under very different circumstances. Lives depend on the quality of aid and, specifically, on the quality of sheltering. Standards play an important role in this hectic process.

Currently, an international standard is being developed to help determine the sheltering requirements that are to be met. However, the proposed requirements are partly too generic or too restrictive for emergency situations. In this paper, we investigate in what manner sheltering requirements can be set that do not hamper innovation in sheltering. We develop a reference framework that meets the three key requirements for sheltering solutions: context-sensitivity, crisis-sensitivity and a performance-oriented approach. Application of the framework promises to increase innovation in and variety among shelter products, and, therefore, to support better tailored and more targeted shelter solutions.

Keywords: emergency shelters, Sphere project, system flexibility, performance standard, reference framework

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1. Introduction

After the 7.6 magnitude earthquake, centred 95 km north-east of Pakistan's capital Islamabad at 08:50 local time on 8 October 2005, according to the Pakistani government over 73,000 people lost their lives and approximately 128,000 were injured. More than 3.5 million people were left homeless.

Because the severe winter in that region was imminent, there was a vast and pressing need for fast winter-sheltering. However, winter tents are treated with chemicals to make them fire and water resistant. Due to this process they cannot be used after three years of storage. Therefore, the storage of a large amount of such tents risks being too much of a waste, and the stock of winter tents was too low for the homeless Pakistani. Although adequate sheltering-aid should in principle be geared to the season and the location of the disaster, in case of the earthquake in Pakistan shelter facilities had to be improvised. The relief agencies were obliged to deliver summer tents to provide at least some kind of sheltering.

The above example is not an exception. In post disaster emergency sheltering shelters are needed fast and mostly in large quantities. Between thousands and millions. Therefore it is crucial to be prepared, and to be aware of the different response required in each situation. Perhaps counter to intuition, standardisation is an important mean to prepare for the unexpected. In post-disaster sheltering there is no time for effective, large-scale improvised solutions. Relief agencies therefore need to be able to rely on protocols and standards. Standards are needed that safeguard the quality, appropriateness and diversity of shelter products [1]. They are to be used by relief organisations and manufacturers to cater to the sheltering requirements in different disaster situations, in different phases of sheltering (emergency, transition, permanent) and in different situations of sheltering aid. Therefore a flexible approach to standardisation is unavoidable.

Currently a standard for emergency sheltering is under development. At the time of writing, the standard is at a stage where comments are welcomed. With this paper we hope to contribute to the discussion by arguing for a standard that improves flexibility in emergency sheltering aid. We propose a reference framework that captures the complexity of emergency situations, which is flexible enough to cater to local requirements, but which also specifies the appropriate standardised sheltering solution.

The structure of the paper is as follows. First, we present the conceptual framework used and explore the role of standards in creating system flexibility. We then analyze developments in sheltering standards. We discuss the Sphere standard, the reasons to revise it, and problematic issues in the standards proposal that is currently underway (section 3). To address these issues, we take an alternative standards approach and develop a reference framework for designing and selecting post-disaster emergency shelters (section 4). We close this article with a proposal for follow-up work (section 5).

2. Standards and System Flexibility

In what manner can standards play a role in increasing the flexibility of the emergency sheltering system? The term *flexibility* refers to "the ease with which a system can adjust to changing circumstances and demands" [2]. In our case, it is the ability to provide the appropriate sheltering resources for any emergency situation.

From the system theory perspective, there are two seemingly opposing views on the relation between standards and system flexibility: standards can be catalysts of entrenchment as well as instruments that facilitate change [3, 4]. The argument that standards are catalysts of socio-technical entrenchment is a relatively straightforward one and combines two perspectives. First, where standards are defined by committees, participants negotiate the specification of the standard. In doing so, they make technical and political choices, which fix the parameters

not only of the standard and the underlying technology but also of the products and services that comply with the standard [5]. They reinforce select technological practices.
Second, standards are guideposts and co-ordinate technology development [6, 7]. They specify the requirements to which compatible products and assets must comply. By increasing market transparency they facilitate market entry by new players. The more successful a standard is in terms of adoption and diffusion, the more entrenched and rigid the standard is likely to become. Thus, the system becomes more difficult to change.
In the counter-argument, the claim is that standards can also facilitate change. Although less established, this claim is theoretically and empirically corroborated [2, 8-11]. Thereby, the underlying key contention is that, because they fix one part of the system, they create room for change in other parts. For example, by standardising the meter a fundament was laid for the field of metrology and modern science as we know it. In the same vein, only by specifying the Internet Protocol the current variety of internet uses has become possible.
Extending this line of reasoning, if standards can increase system flexibility, are certain standards' characteristics better equipped to do so than others? Or, worded more concisely, is system flexibility best served by flexible standards? Two characteristics of flexible standards are particularly relevant for increasing the flexibility of the sheltering system [11]:

- *Reference frameworks*. In more complex systems it is not sufficient simply to define requirements or functions, but it also becomes necessary to define the relations between these requirements or functions. In response, reference frameworks are developed. [12, p.7]. They provide system flexibility because they apply to a wide range of situations. In the case of emergency shelters, a reference framework is needed that can help identify the most appropriate type of shelter in a specific situation, and the standards to which this shelter must conform.
- *Performance standards.* These indicate the required performance or function of a product, service or system. How these functions are technically implemented is left open. They are usually contrasted to product specifications or *product standards*: "The amount of detail in a standard can vary. Some standards only specify the required performance of a product or service (performance standards) rather than design or descriptive characteristics, as do product specifications. The latter, of course, impose more restrictions on technical development." [13, pp. 43-44] That is, once the most appropriate type of shelter has been defined in a specific situation, the standards to which this shelter should conform must be defined. Where possible such standards should be performance standards, because these least restrict technology development.[2]

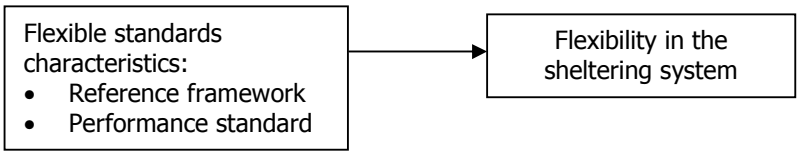

Figure 1. The two most relevant standards characteristics to increase flexibility in the sheltering system.

[2] This view on standards and innovation is supported by the Agreement on Technical Barriers to Trade [14, p.136]: "Wherever appropriate, the standardizing body shall specify standards based on product requirements in terms of performance rather than design or descriptive characteristics."

Figure 1 illustrates our line of reasoning. In the next section, the 'performance standard' criterion is used to examine sheltering requirements in current standards initiatives and the degree of innovation which they allow.

3. Existing Standard Initiatives

According to Corsellis and Vitale [16] a *shelter* is a 'habitable covered living space, providing a secure, healthy living environment with privacy and dignity for those within it'. In the specific case of post-disaster sheltering, shelters are often used for years, even for generations; while, according to the international protocol, the maximum period for using an emergency shelter ought to be between 18 and 36 months. That is, emergency shelters are used for transitional and permanent sheltering. *Transitional shelters* are shelters that bridge the interim period between being forced to leave home and achieving a durable shelter solution [16]. The necessity of transitional and permanent sheltering, such as the experiences in Darfur and Bam, show that the possibility to transform emergency shelters into transitional and permanent habitats is a desirable both from the point of view of the relief organisations and the beneficiaries.

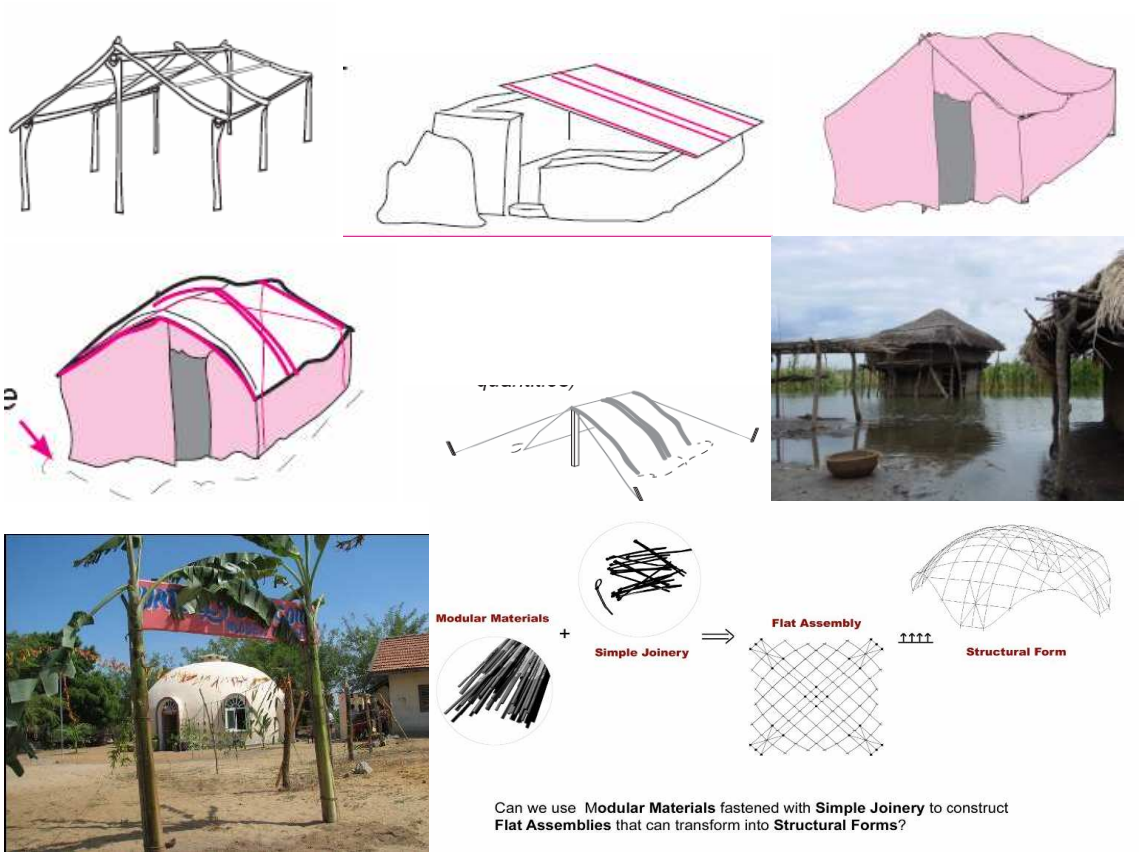

Figure 2. Examples of shelters [17].

3.1 Sphere

The first initiative to standardize sheltering requirements, called the Sphere project, was launched in 1997 by a group of humanitarian NGOs, the Red Cross and the Red Crescent. It was to develop a common framework and improve the accountability of humanitarian aid. The project formulated a Humanitarian Charter and identified Minimum Standards to be

attained in disaster assistance in five sectors of aid: water supply and sanitation, nutrition, food aid, shelter and health services. It led to the Sphere handbook in 2000 [18].
The Sphere Project has since expanded the Handbook to include additional sectors and incorporate evolving best practices derived from academic and field experiences. However, the humanitarian community uses Sphere standards inconsistently: Sphere indicators were dismissed in the case of Pakistan because strictly applying the Sphere-approved quality levels would have led to insufficient shelter supply.

3.2 Shelter Standards

After the tsunami in 2004 in Indonesia, having evaluated the sheltering process, the United Nations noted a lack of clear standards and of a committee or organisation that was responsible for the whole range of sheltering activity. After many meetings and long discussions, the relief organisations and UN bodies agreed that a new coordinated initiative for optimizing the sphere standards was needed, the so-called Shelter Center, that was to formulate improved shelter requirements [16]. The requirements are currently being specified.
Although the shelter center aims for performance standards and innovation [19], a content analysis of the proposal shows overly use of product standards. Taking the flexibility perspective on providing shelters, two types of problems occur.

3.2.1 Product Standards

The sheltering requirements vary per disaster, per location and per season. The following requirements from the draft shelter standard illustrate that generalisation of givens for specific situations can exclude products, which could perform perfectly under other conditions [19, par. 28-31]:

- *The shelter shall withstand 1,500 N/m² of snow loading without damage or changes reducing the functional capacity.*
- *The cover shall withstand 1500 mm water column minimum.*
- *The ground sheet shall withstand 1500 mm water column minimum.*
- *In warm, humid climates the roof shall have a reasonable slope for rain water drainage.*

The requirements embed too many assumptions, such as that it will snow and rain (climate), and that the shelter has a flat roof (product shape), and thus exclude products with a different shape that may perform adequately in a dry and warm climate. The costs of designing and producing shelters that meet all these requirements may needlessly increase. Cheaper solutions are hindered.
Too much specificity may also apply to what should *not* be done or used, as the following requirement illustrates [19, par. 81]:

- *Use of zippers and fixing methods such as proprietary clips and Velcro shall be minimized for use in functions that must be used frequently, such as doors and windows.*

The rationale behind this criterion is to guarantee the safety of the shelter beneficiaries. Zippers can become defect, and in case of fire and other calamities, people can get trapped in a shelter. However, also in this case it would be more appropriate to formulate durability specifications (i.e., performance-standards) for fixing the doors and windows of a shelter.

3.2.2 Lack of specificity

In contrast, some shelter requirements leave much room for innovation, but are too unspecified to be useful as design guidelines. Examples are the requirements for weight and the transportation [19, par. 11-13]:

- *A complete shelter package shall have a mass between 40 kg and 80 kg.*
- *The total shelter shall be in one package which contains smaller packages broken down into parcels of weights suitable for transport by two people.*
- *A complete shelter package shall have a packed volume between 0.3m^3 and 0.5m^3.*

We recognize that the tension between leaving room for innovation and providing clear guidelines is a difficult one to address. However, the above requirements raise questions about the strength of two people, the exact measurements of the package, and how the shelter is to be transported. With regard to the latter question, wherever possible, ISO containers are used to transport shelters because this is the most efficient and cost-effective means of transportation. From this point of view, it would seem obvious to specify the exact measurement of shelter packages. However, also in this case, too restrictive standards hinder innovation.

3.2.3 Analysis

In sum, requirements for post-disaster emergency shelters need to be exact yet not too specific. They need to leave room for innovation. Wherever possible, the current draft standard should prefer the 'performance standard' approach. Moreover, the chosen range of requirement flexibility should be motivated in order to help interpret and correctly implement requirements.

4. Reference Framework for a Performance-based Approach

When a disaster occurs, relief organisations currently use checklists that serve as guidelines for decision-making in post-disaster sheltering [20-23]. They purchase shelter products from a catalogue, the UN handbook for tents. This catalogue complies with the Sphere standard. However, since the Sphere standard derives its requirements from the available set of products, an undesirable self-reinforcing entrenchment process develops. Moreover, we hold that a reference framework is needed, rather than the current list of requirements, to help determine the optimal shelter design in a given situation.[3]

Although architecture and design are not the first to come in mind, when thinking of post disaster emergency- shelters, a well designed shelter can have advantages in use and in well-being of the beneficiaries.[4] To optimally design post-disaster shelters, we argue the need for a reference framework that takes into account three general requirements, i.e.

- context sensitivity
- crisis sensitivity
- a 'performance standard'-oriented approach

[3] That is, sheltering aid should not be provided in isolation from its wider environmental, economic, political, cultural and social context.

[4] The word 'design' is used when there is a creative process, a plan for action and a purpose such as the design of cars, furniture, or computer games. Defining and managing desirable and possible requirements are key elements for successful design – and in this case, the design of shelters. A design process contains the following steps: Strategic phase, Definition of design goals, Problem definition, Analysis of the problem, Analysis of the existing solutions; Creation phase, Designing the product; Development phase, Testing and Optimisation; Realisation phase, Preparing for introduction to the market. [24]

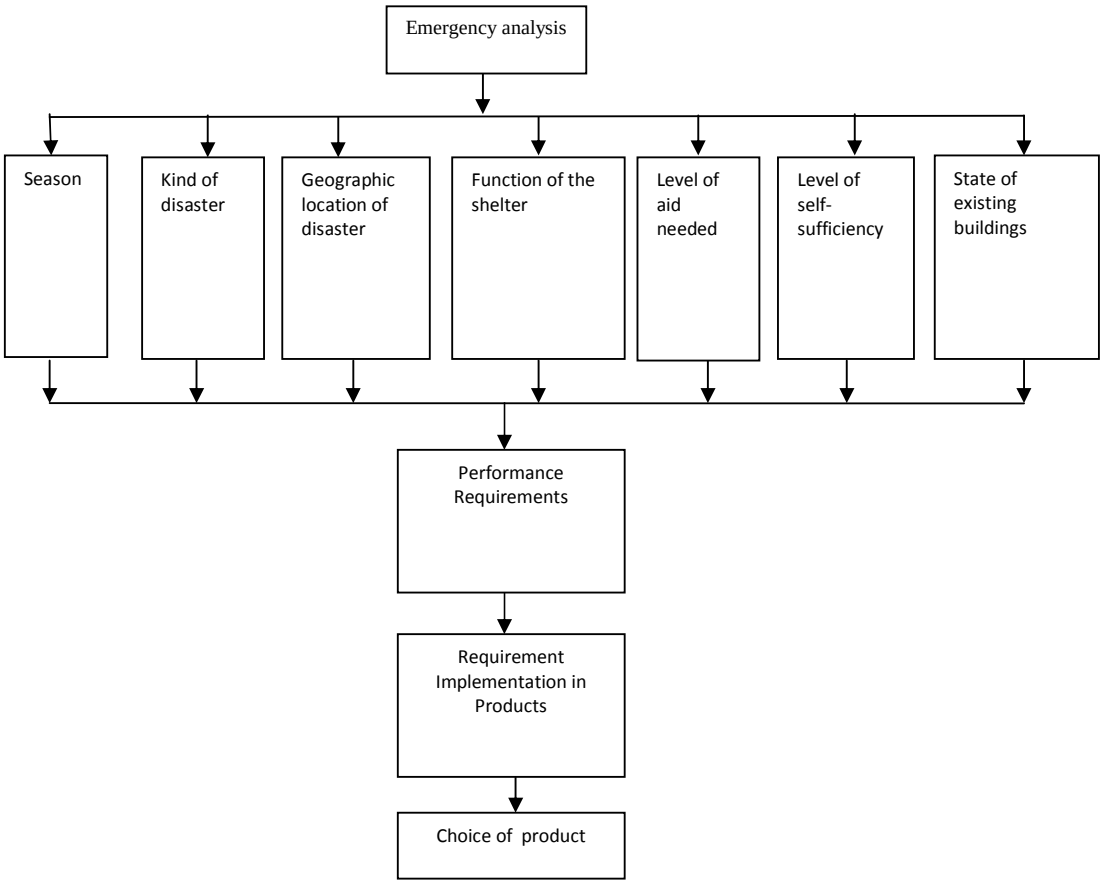

Figure 3. Reference framework to support shelter design product choice

Based on an extensive study of relevant existing literature [25] and conversations with international experts[5], we have developed a reference framework. This framework starts out from the assumption that in all post-disaster emergency situations an emergency analysis has to take place that takes into account the following seven basic variables (see Figure 3)[6]:

- Season of the year: Shelter aid depends on the season. Winter, summer and rain period each represent different sheltering conditions and pose specific requirements.
- It is relevant to know which kind of disaster is at stake in case the disaster can reoccur and precautions have to be taken to prevent damage to the transitional shelters. In addition, the accessibility of the region is often determined by the disaster.
- The geographic location provides climate, cultural, political and social information about the region.
- Depending on the function of a shelter, different measurement, technical and functional requirements will be set.

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[6] Each of the above variables is more elaborately specified elsewhere. More detail would go beyond the scope of the current article. The first author is currently working on an internal document that addresses this issue. For more information please contact her.

- The level of aid can cover the international, national or regional aid, or differ from basic plastic sheets to high-tech shelters.
- The level of self-sufficiency includes both the self-sufficiency of the shelter in respect to energy and technical equipment, and the self-sufficiency of the beneficiaries in terms of building and sustaining the shelter.
- The state of existing buildings determines whether shelters are needed from elsewhere, for example, because existing buildings cannot meet the shelter requirements. With help of satellite communication, the safety and usability of the remaining buildings could be assessed. If the shelter requirements were clear, within minutes, the decision could be made to deliver extra shelters of a certain type.

An emergency analysis must specify - with help of the seven variables - the context- and crisis-specific requirements in terms of the performance needed. Application of the framework allows for maximum flexibility in the sheltering system and product innovation.
Because the framework makes explicit the range of possible requirements, different vendors can more easily implement them in products. More product variety and innovation promises to result. The relief agencies have more choice among products.

5. Conclusion

The necessity of standards for stimulating transparency and exchangeability in the sheltering process, and therefore increasing the efficiency of the shelter relief is recognised by the international community. However standards are yet to be formulated in a way that stimulates innovation, flexibility, market transparency and improves the compatibility of various systems.
In this article, a flexible framework has been proposed that is designed to serve as the basis for a future expert system on emergency shelters. Performance standards are core instruments in achieving this. They deliver the flexibility which is crucial in the hectic environment of post-disaster emergency sheltering.

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