

Temporary shelters: An architectural look at user-environment relationships

Abrigos temporários: um olhar arquitetônico sobre a relação entre usuário e ambiente

Manuela Marques Lalane Nappi¹

Universidade Federal de Santa Catarina

lalppi.ms@gmail.com

João Carlos Souza¹

Universidade Federal de Santa Catarina

joao.carlos@ufsc.br

Abstract – Temporary shelters are directly related to human survival in the early stages of a disaster. In that sense, shelters must provide an adequate response, focusing on spatial characteristics that should be relevant to social and environmental expectations. These work studies which spatial attributes of temporary shelters must be explored through a dimensional approach of public places proposed by Holanda and Kohlsdorf. Designing temporary shelters with a specific regard on the user-environment relationship is an activity that must also be based on the compatibility between the principles of Sustainable Development and Humanitarian Logistics, concepts that will be also approached in this study. From the dimensional approach to places, the authors also present spatial attributes that must be explored when seeking the best possible performance for temporary shelters.

Keywords: architecture, emergency shelters, spatial attributes, Humanitarian Logistics, natural disaster.

Resumo – Os abrigos temporários estão diretamente relacionados com a sobrevivência humana nas fases iniciais de um desastre. Nesse sentido, o abrigo deve oferecer uma resposta adequada, com foco em características espaciais pertinentes a expectativas socioambientais. Projetar abrigos temporários com um olhar especial para a relação entre usuário e ambiente é uma atividade que também deve estar pautada na compatibilização entre os princípios de Desenvolvimento Sustentável e de Logística Humanitária, conceitos brevemente discutidos neste trabalho. A partir da abordagem dimensional dos lugares, metodologia desenvolvida por Holanda e Kohlsdorf, são apresentados atributos espaciais que devem ser explorados na busca de um bom desempenho para abrigos temporários, tendo como foco a relação entre usuário e ambiente.

Palavras-chave: arquitetura, abrigos temporários, atributos espaciais, Logística Humanitária, desastre natural.

Introduction

The effects of recent natural disasters around the world has led to the rapid development of a new area of research: Humanitarian Logistics. The identification, analysis and solutions related to the problems of accessibility to public services and social issues in general, have attracted the attention of a significant portion of society. These issues have been the subject of research and theories developed by members of the project “Logistics Systems, Emergency and Transport” research group in *Humanitarian Logistics – NPLOG* of the Universidade Federal de Santa Catarina.

The international community recognizes the increase of natural and human-caused disasters, as well

as their magnitude and the number of people affected by them. Data provided by the UNDP (2004) show that 75% of the world’s population lives in areas that have been affected by earthquake, tropical cyclone, flood or drought at least once between 1980 and 2000 (Nappi and Souza, 2015). To society, *disaster* is understood as an impact or a loss of such magnitude that it results in a condition of inability to deal with, absorb and recover from such crises with its own resources (Cardona *et al.*, 2003).

Preparing for a disaster is now considered a crucial element in reducing the impact these events might cause. The preparation phase has been receiving more and more attention in order to hasten first disaster aid assistance and improve its efficacy. If in one hand prospecting the risks should be part of the sustainable planning, on the other,

¹ Universidade Federal de Santa Catarina. Campus Reitor João David Ferreira Lima, s/n, Trindade, 88040-900, Florianópolis, SC, Brasil.

compensatory management should be encouraged, focusing on disaster response and overcoming vulnerabilities (Nappi, 2016).

“Immediately after a disaster, the priority actions are locating victims, providing medical care for injured people, providing water, food and shelter to the survivors” (Nappi and Souza, 2015, p. 3). About temporary shelters, Nappi (2016) brings that it is quite hard to precise for how long they will be needed, but it is notorious that these structures should be planned and provided before the occurrence of predictable disasters. Preparing and positioning the shelters previously have an important role, since time is such a decisive factor to the effectiveness of human suffering relief during the disaster response. Noticeably, preparing and positioning all sorts of supplies – temporary shelters included – is a fundamental task that goes along with evacuation strategies.

Temporary shelters are directly related to human survival in the early stages of a disaster. They contribute to ensuring security and protection against weather conditions, as well as human dignity, family and community life, enabling the affected population to recover from the consequences of the disaster. In that sense, Figure 1 illustrates the importance of temporary sheltering in compensatory management, as a catalysing agent towards post disaster recuperation.

According to Rolnik (2011), the general orientation towards post disaster sheltering overlooks basic human rights, concerning not only adequate dwelling but also other rights. This reinforces the necessity of approach studies (such as the present/on the matter).

According to Nappi and Souza (2015), the lack of criteria regarding planning and establishing temporary shelters may lead to unpredictable factors. Often, decisions on the matter are only taken after a catastrophic event, when there is not sufficient time for a thorough reflection on the essential rules that should lead choosing and building temporary shelters (Omidvar *et al.*, 2013).

The shelter services should support strategies to overcome the effects of the disaster, by making the most of local skills and resources without hazarding the affected population or the local economy. Any response must take in consideration the risks of predicable disaster and minimize long-term negative effects on the environment (El Proyecto Esfera, 2011). Nevertheless, permanent shelters specifically created for the homeless in infrastructures equipped with dormitories, refectories and sufficient male and female toilets are rare (Valêncio *et al.*, 2008).

There are various types of shelter: the fixed temporary shelter, the provisional self-built shelter, the replacing shelter, the temporary outdoor shelter and the community or collective shelters (for more information see UNICEF, 2008). Although there are different types of structures that can be used as temporary shelter, this study does not focus on a specific one.

The right to shelter is implicit in the Universal Declaration of Human Rights and other documents drawn up by multilateral organizations such as the UN. The first Conference for emergency shelters – First International Emergency Settlement Conference – in 1996, in Wisconsin, United States, established the access to basic and contextually appropriate shelter as an essential human need. Such shelter patterns may vary depending on cultural contexts, situation and the climate, among other factors (Anders, 2007).

The physical form of these places represents a very important spatial language, acquiring different meanings according to individual interpretation. In this sense, it is important to be attentive to the fact that the user perception might differ from the one aimed during the designing activity, for it depends on human senses. The places’ identity is built and based on the information absorbed and decoded by the user (Kohlsdorf, 2012).

For Valêncio *et al.* (2008), the temporary shelter does not share the typical territoriality of a house in its many spatial functions, where private roles are exercised, or of a home, where cohesion between the members and the group’s identity are reaffirmed on a daily basis. The institutional design of a temporary shelter is to provide the homeless with a site organized by public rationality and rules, to which the affected citizens must submit. For the authors, the lack of private space in a temporary shelter is a relevant factor in the disruption of the family life and social identity of its members. Therefore, a disaster that drives people homeless has the potential of destabilizing community and family life (Valêncio, 2009b).

In a previous work, Nappi (2016) has developed temporary shelters performance measuring criteria system that was then used to build a model for selecting and locating shelters through a multicriteria methodology. The data that allowed the construction of this model was gathered from the experience of a group of specialists involved direct or indirectly in the selection, location

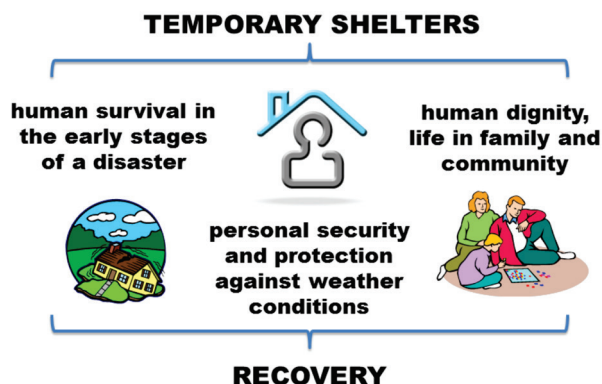


Figure 1. Temporary shelters – recovery from the consequences of the disaster.

and administration of temporary shelters. These specialists regarded the privacy of the families affected as one of the most important aspects to be considered. This is corroborated by the main national and international documents on the subject, such as the Sphere Handbook (El Proyecto Esfera, 2011).

The Sphere Project was started in 1997 by a group of non-governmental organizations and the International Movements of Red Cross and Red Crescent in order to develop a set of universal minimum standards regarding key aspects of humanitarian response: The Sphere Handbook (El Proyecto Esfera, 2011). The main objective of the manual developed by El Proyecto Esfera (2011) is to guide the initial humanitarian action after the occurrence of a disaster, but the minimum standards can be applied to the preparation phase and during the transition phase of recovery and reconstruction activities. The importance of privacy is reinforced in two of the guidelines:

(a) Strategic Project – this guideline states that during the planning of community shelters it is essential to take into account occupant safety, privacy and dignity, as well as access to essential services.

(b) Sheltered vital areas – this guidelines brings that it is essential to maximize the psychosocial benefits resulting of having adequate environments where privacy is respected and overcrowding is minimized. In this sense, organizing groups by affinity or kinship, planning access routes through sheltered, covered areas and providing materials to separate personal and family space can help ensure privacy and safety.

To design an ambience, it is clear that one needs to consider the place's performance goals, which is formed by the assumption of conduct codes that may be different from the users' codes. Therefore, one must adopt a cognitive approach, based on links between humans and their environment. The information provided by these places turns into spatial notions from the human perception and from practices that develop themselves in space (Kohlsdorf, 2001).

The spaces approach used by architects must be justified by the present and future reality of the aimed population. However, the decisions taken in project design and development processes not only have immediate effect on society, but also directly affect the impact on the natural environment as well as buildings environmental quality (Andrade *et al.*, 2007).

The environmental quality of a building provides comfort for human beings as claimed by Andrade *et al.* (2007). In addition, the proposal of designing temporary shelters with a specific look at the relationship between the environment and the user, can also be based, for example, on the compatibility between the principles of Sustainable Development and Humanitarian Logistics. Bearing in mind that the main objective of any sustainable action

involves reducing the impact of environmental degradation on the victims of natural disasters, the Environmental Protection Agency (EPA, 2012) provides the following definition of sustainability:

Sustainability is based on a simple principle: Everything that we need for our survival and well-being depends, either directly or indirectly, on our natural environment. To pursue sustainability is to create and maintain the conditions under which humans and nature can exist in productive harmony to support present and future generations.

Humanitarian Logistics refers to processes and systems involved in mobilizing people, resources and knowledge to help vulnerable communities affected by natural disasters or complex emergencies, minimizing the loss of lives and alleviating human suffering (Thomas, 2007).

Since the 1970s, with more emphasis in the 1980s and 1990s, researchers on Social and Human Sciences have argued that the repercussions of a natural threat are not only consequence of the physical endurance of the physical structure but also of the people's ability to absorb the impact and to recover from losses or damages. Thus, vulnerability is considered a reflection of physical, social, economic and environmental conditions, both individual and collectively. When governed by human activity, vulnerability should not be considered independently of development activities. Thus, vulnerability plays a decisive role in sustainable development (UNDP, 2004).

For Nappi and Souza (2014), the three spheres of Sustainable Development (economic, social and environmental) may be approached in conjunction with widely accepted essential principles of Humanitarian Logistics: humanity, impartiality, neutrality. Humanity implies that human suffering must be alleviated wherever found. It is the reason why humanitarian organizations are implemented in the first place. Neutrality implies that the relief should be provided without political, religious prejudice or any other influence. Impartiality implies that assistance must be provided without discrimination prioritizing the most urgent needs (Tomasini and Van Wassenhove, 2009).

In this sense, Figure 2 reinforces the close connection between the pillars of Sustainability and the principles of Humanitarian Logistics, which must be present in all phases of humanitarian actions, recalling that progress in the management and in the reduction of disasters depends on changes in policies and planning for sustainable development.

It is known that edification causes environmental impacts from the beginning to the end of its productive chain, whether by the occupation of productive lands, raw materials extraction or transportation and others. The search for a sustainable attitude in the architecture fields requires the incorporation of changes in the con-



Figure 2. Sustainability + humanitarian action.

struction process, the professional experience, and, even the user. But the attributes that permit the examination, evaluation and proposition of architectural spaces are morphological. That is, from the characterization of the morphological attributes of the ambiances, it is possible to evaluate how they will influence the performance of such spaces. In terms of Architecture, when it comes to the concept of performance,

the fulfillment of performance criteria related to personal tastes and habits such as visual comfort and spatial adequacy depends on the sensitivity and artistic ability of the architect in designing the project. The project's conformity to technical criteria, which can be quantified and analyzed based on specific knowledge, tests and statistical data, depends on the repertoire and access to the information of the professional designer and specifier (Waelkens and Mitidieri Filho, 2012).

Holanda and Kohlsdorf (1994) propose that the same space quality may vary according to expectations. Characteristics of the physical form cause different responses to social expectations. On the one hand, it can properly attend functional expectations and on the other hand it does not succeed so well under an economical perspective (Kohlsdorf, 2002).

For the designer to be aware of how his proposals outcome will be seized by future users, she or he will need to examine a spatial attribute type that contains elements that are common to all people. Two modes of knowledge and reality representation need to be accumulated and articulated. One is restricted to technical knowledge, conditioned to formal and logic mental structures, and the other is comprehensive and related to the center of perception, bound to the sensorial system.

One way to correlate the attributes of places and social expectations is given by the spatial dimensional approach, by examining which spatial characteristics influence the expected performance of the spaces. The objective of this approach is to evaluate the performance of places at design and post-occupancy stages (Kohlsdorf, 2006).

Method

This is a work of applied nature and it aims at attaining knowledge from the understanding and solution of specific problems. In addition, the research approach can be defined as qualitative and exploratory, with the purpose to provide the researcher a greater familiarity with the problem.

Furthermore, according to Marconi and Lakatos (2003), this research can be classified as bibliographic and documental, concerning technical procedures and the review of documents published by recognized organizations and other specialized literature sources, such as the International Red Cross and Red Crescent Movement with the Sphere Project; the United Nations Children's Fund (UNICEF) in its various publications; the General Assembly of the United Nations (UN), specifically in the documents of UN Special Rapporteur on Housing, Raquel Rolnik; and the Secretary of State for Civil Defense of Rio de Janeiro (Secretaria de Estado da Defesa Civil do Rio de Janeiro), with the Administration Manual for Temporary Shelters (SEDEC/RJ, 2006).

The Sphere Handbook was the most extensive document found in the reviewed literature on the subject of minimum housing in post-disaster situations. The minimum standards set in this document are a concrete expression of the convictions and commitments that humanitarian organizations share, based on the principle of humanity and enshrined by international laws, addressing the right to life and dignity, the right to protection and security, and the right to receive humanitarian assistance according to the needs that arise (Nappi and Souza, 2015).

The minimum standards set out in the Sphere Handbook, however, do not represent the full expression of the right to adequate housing, but address essential issues related to this right, contributing to its progressive realization throughout the world. Those standards are a concrete expression of the convictions and commitments that humanitarian organizations share. In humanitarian responses, the right for shelter is inherent to the right for adequate housing as was established by the Human Rights (El Proyecto Esfera, 2011).

For temporary shelters specifically, the focus should be on preparedness and response to natural disasters, seeking to provide increased capacity of emergency care and strengthen people, community and government's capacities in supporting disaster response (Thomas, 2007).

Table 1. Dimensions x social expectations x morphological attributes.

Dimensions	Social expectations	Characteristics – morphological attributes
Functional	Space response to some activities performing expectations	Functional
Bioclimatic	Space response to hygrothermic, acoustic, light comfort and air quality expectations	Bioclimatic
Co-presence	Space response to unscheduled free meetings facilities in public areas expectations	Co-presence
Configurative	Space response to places' guidance and identification expectations	Configurative
Economic	Space response to determined construction and maintenance costs expectations	Economic-financial
Expressive and symbolic	Space response to symbolic representations' expectations	Expressive-symbolic

Source: Andrade *et al.* (2007).

Table 2. Super dimensions x social expectations.

Super dimensions	Social expectations
Ethic	Space response to the relations beaconing between individuals
Ecologic	Space response to the relations beaconing between individuals and natural environment
Esthetic	Space response to beauty expectations in relations between individuals and the world

Source: Andrade *et al.* (2007).

The dimensional approach of places proposed by the Holanda and Kohlsdorf (1994), which sought to raise spatial attributes of temporary shelters, must be exploited within an approach focused on the relationship between user and environment.

For Hillier and Leaman (1976), the discipline of architecture is centered on a study of “codes”, responsible for the “structure of connections between human needs and real world physical artifacts” (p. 31). These codes enable the architect to design “the roles that society requires from buildings” (p. 29).

Holanda and Kohlsdorf (1994) mention the Hillier and Leaman (1974) “four functions model”, which contained four comprehensive categories focusing on the building functions: climate change, symbolic expression, resource modification and mainland activities. The authors suggest that these categories, which approach the performance of the space in use, should be deployed in order to embrace recent researches and identify existing gaps.

The overall assessment appears as a weighting between partial evaluations. The classification of such expectations produces the taxonomy of the place in question; i.e., dimensions with different descriptions of the same place, according to different attributes (Andrade *et al.*, 2007), as may be observed in Table 1. Originally, there are no differences of values between the six given dimensions. The prevalence of one or another depends on people, groups, and cultural contexts.

The functional issue constitutes the first level of description of the discussion on architecture and its social

implications. The second level proposed by Holanda and Kohlsdorf (1994) concerns the ecological, ethics and aesthetics assessment of this phenomenon. For the authors, the architecture approach “works” because it attends human expectations, which change throughout history, also modifying also the architecture styles. In that sense, it is necessary to distinguish different dimensions of the same function: ecologic, ethic, and aesthetic. According to Andrade *et al.* (2007), wherever social process exists, there are relations between people, between people and environment, and between people and the symbolic world. Table 2 shows these relations in three super dimensions.

According to Valêncio (2009a), when displaced from risk areas, people lose the bond with their homes, relationships and space habits, they lose the bond they have with their goods and their environment. If the shelter does not offer adequate responses, focused on spatial characteristics, relevant to social and environmental expectations, there is a risk that it becomes an inappropriate space for its users to express themselves spatially (Valêncio, 2009a). Therefore, the design of temporary shelters plays an important role on social recovery.

Results

Considering the space dimensional approach proposed by Holanda and Kohlsdorf (1994), one should reckon which spatial attributes of the temporary shelter must be operated within each dimension. The spatial attributes presented here are based primarily on docu-

ments published by the humanitarian aid organizations, mentioned above. The grouping of these attributes was based on the application of the methodology proposed by the authors, seeking to correlate them with the social expectations pertinent to each analyzed dimension. The issues raised on the following items are not exhaustive and express the needs inherent to this type of equipment, but may be considered as the launch of a new approach, centered on the relationship between the user and the environment (Kohlsdorf, 2001).

Functional dimension

(a) The temporary shelter must have direct, easy and secure access to schools and recreational areas, churches, markets, as well as other services necessary to the subsistence and daily well-being of its occupants (Figure 3).

(b) The design of the temporary shelters has to include areas of coexistence, circulation, meeting, dormitories and to each family a safe, private sheltered area.

(c) The shelter space division must minimize the disruption of family cohesion, through providing proximity for intimate activities (sleeping, sanitizing) and supporting group activities (preparation and consumption of meals, leisure and entertainment).

(d) The communities affected by disaster must be provided with at least 3.5 squared meters of sheltered area per person, since a smaller area may affect negatively one's health, privacy and dignity.

(e) All solutions adopted should follow technical specifications and be culturally acceptable. Minimum sanitary installations, showers, washing basins and water availability should also be comprised.

Bioclimatic dimension

(a) The temporary shelter must be designed so as to optimize natural ventilation and minimize direct exposure to the sun.

(b) Its design and construction must guarantee noise control, through the size of the enclosures and proportion and opacity of materials to sound transmission and reverberation.

(c) The temporary shelter design should allow adjustments to be made according to climate change modifications and their consequences in the local environment.

(d) Trees or vegetation in general should be preserved, whenever possible, in order to increase water retention, minimize soil erosion and provide shade.

Co-presence dimension

(a) The temporary shelter must have vast living areas adequate to the total number of users, as well as

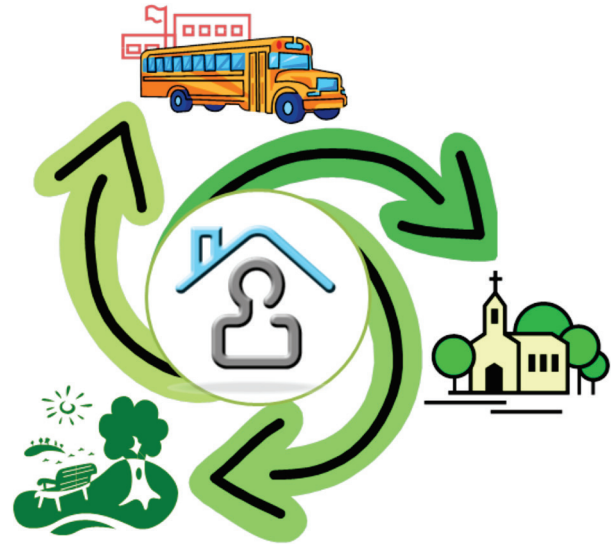


Figure 3. Easy and secure access.

smaller areas, for the coexistence of members of the same neighborhood or family.

(b) It also must have not only a clear axis of integration where to locate coexistence areas but also more secreted axes to provide exclusive areas for smaller groups of families.

(c) The temporary shelters must follow the original neighborhood logic and maintain family cohesion, promoting the maintenance of bonds of affection through the creation of areas with high degree of constitutivity and on the more segregated axis, promoting the access and cohabitation of the families gathered in groups.

(d) The areas for the coexistence of family group must be sensorially closed off, trending to social aggregation (convexity). There must be as well as areas for entertainment, preferably with equipment for movies reproduction, stereos, sofas and views to external areas (windows that look out onto green areas, etc.).

(e) The dormitories, separated by families, with a high degree of privacy, must be located in end of the axes where there is little circulation (more segregated) (Figure 4).

In Figure 4, there is a schematical exemple of a clear axes conformation within the temporary shelter. At the same time, one's attention is drawn to the need for spatial ordering of the different functions performed in the shelter, in order to ensure the effective spatial orientation of its users, especially those who demand more attention.

Configurative dimension

(a) The internal spatial arrangement of the temporary shelter must take into account the difficulties that

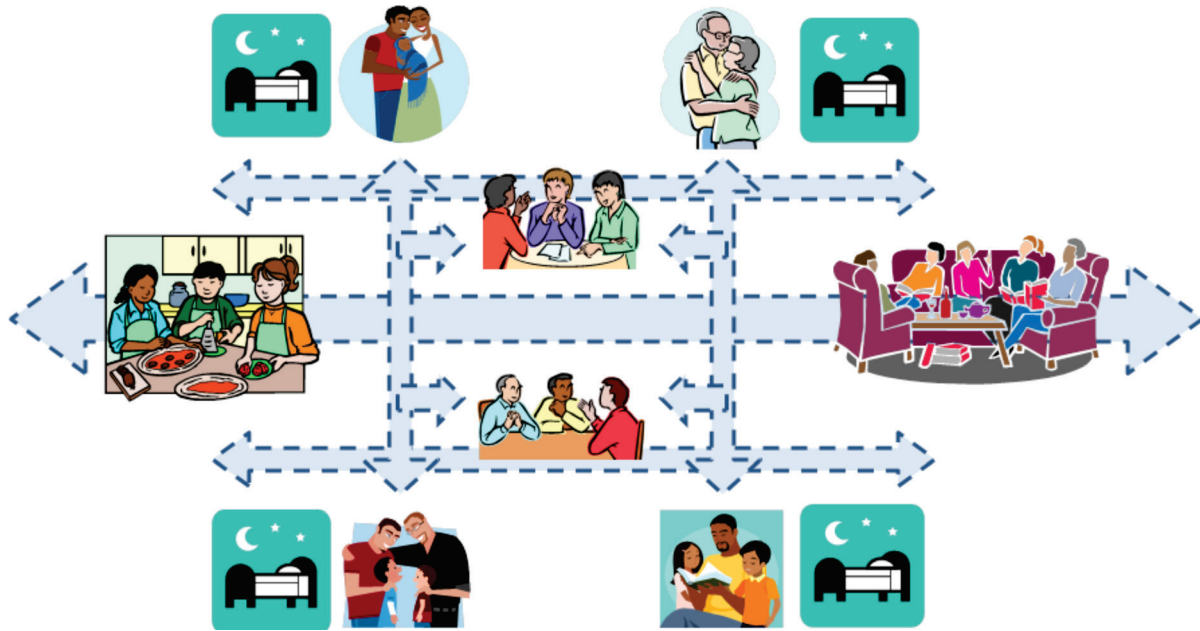


Figure 4. Integration axes.

the elder, the children and the people with special needs may have to locate and guide themselves in new places.

(b) Visual information leading to the temporary shelter must be clear and accessible, ensuring to users the location and orientation. This can be done by providing a clear path axis to follow where a small amount of stations and visual panels should be displayed with frontal and clear topological effects and prospects.

Economic dimension²

(a) In temporary shelters, the dimensional solutions adopted (length, width, ceiling height and number of floors) must guarantee the minimization of building costs.

(b) The temporary shelters designs should have approximate compactness levels of around 88.6%, reducing the construction costs and thermal losses and, consequently, the buildings' maintenance costs.

(c) The internal spaces, with particular attention to circulations, must also show high compactness indices, considering that the higher the compactness level, the lower the cost.

(d) The design of the temporary shelters must avoid unnecessary edges, curved areas, and elongated forms, which increase the construction costs.

(e) Special attention must be paid to preventive maintenance of equipment and complementary facilities, which construction costs vary very little related to their

size, remaining close to 25% of the total construction cost. In this way, the maintenance represents an average of 60% and 70% of the total building costs. Therefore, major participation on the cost of shelters throughout their lifespan.

(f) Whenever possible, temporary shelters must be built in high land areas, seeking to use gravity to minimize spending on supply networks (water, sewage, electricity, etc.).

Expressive and symbolic dimension

(a) The design of the temporary shelters must conform to community cultural aspects. The shelters should be visually pleasant to users both inside and outside, and be suited to their external environment.

(b) Temporary shelters should have housing characteristics, that allow users to identify themselves as safe, private and dignified, which can be achieved by: the use of, elements that stand out visually (marks) to provide orientation features; the continuity between the spaces that comprise the uses' hierarchy; the clarity provided by architectural elements; the dominance of the proportions according to the hierarchy of the proposed spaces; the complexity given by the comparison between the different spaces that relate with each other on a diversified way; and, finally, the variability given by the properties of transformation and usage adaptability.

² Based on Mascará (2006).

(c) The spaces within temporary shelters must offer good readability, with a precise and rigorous design that makes use of the following qualities: the totality perception possibility, which means that the architectural object is permanently registered; individuality, being the unique and unmistakable architectural form; and continuity, that is given by the parts arrangement of the parts inside a system of elements.

Conclusions

The dimensional approach of the places proposed by Holanda and Kohlsdorf (1994), which sought to list spatial attributes of temporary shelters, must be explored by focusing on the relationship between the user and environment. This approach goes beyond simply identifying the minimum requirements that must be met in the design of temporary shelters, it also considers how to achieve the expectations of users.

It is worth mentioning that the task of designing temporary shelters with the best performance for the socially defined expectations of its users must consider the spaces evaluation, which is undertaken through common sense. Alves (2007, p. 14) asserts that “science is a common sense metamorphosis”. Which enables us to set an analogy for architecture as a relational situation: the architectural spaces that have good performance are born from expertise, as the result of the maturity of an evaluation conducted by common sense. This does not mean that to evaluate the performance of a building it would be enough to ask users how satisfied they are with the architectural object. Holanda and Kohlsdorf (1994) argue that human expectations change throughout history, forming systems of historical values. Therefore, these expectations must be understood in a critical way. The authors complement that, in addition to the correspondence between the architectural performance and the social expectations, the set of historical values is what rules expectations and performance evaluation.

For Gralla *et al.* (2014), the challenge in applying certain approaches is to measure the preferences of the individual beneficiaries. This can become an arduous task in the midst of an emergency situation where meeting the users’ preferences may be impractical or present low priority compared to needs assessment and aid delivery. Experienced humanitarian workers, on the other hand, often understand the preferences of the beneficiaries and may also be better able to determine some aspects than simple research. Their multiple experience in various emergency situations can better translate the needs of future emergencies. Hence the importance of an approach centered on the review of documents published by humanitarian aid organizations for the development of this proposal.

Therefore, when looking at the relationship between the user and her or his environment from an architectural perspective, the objective of this research

was to promote a distinct approach in the establishment of temporary shelters, without the intention of exhausting a set of needs inherent to this type of equipment.

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