

Urgent projects in emerging situations: design for flood affected shelterless people

Lara^{*1}, Leite Barbosa

¹ PhD Professor, Design Department at School of Architecture and Urbanism, University of São Paulo, Brazil

Abstract

In recent years, not only the population, but the whole world has been widely affected by excessive rainfall. As a result of exceptional circumstances, inhabiting the disaster is fundamentally a contemporary issue. This problem requires a thorough study on its formation, construction, installation, permanence, recurrence and, above all, its consequences. This article introduces the initial results of the research "Emergency Design: Furniture and Equipment Design for Temporary Shelters to Groups Affected by Disasters Related to Rainfall", submitted for assessment by FAPESP for The Young Investigators Awards in Emerging Center. The research aims at making a pilot project, taking as case study the city of Eldorado, which can be replicated in other cities in the Vale do Ribeira region, constantly affected by heavy rains. As a result, studies of possible deployments for temporary shelters and other facilities necessary to meet disaster needs are expected, with furniture and equipment designs developed from the aspirations of a collaborative group with experience in emergency flood situation. This article reflects primarily on the spatiality of temporary shelters. It presents the research and its methodology, discusses the results of a participatory experience, analyzes equipment solutions for rehabilitation practice and suggests reframing architecture in terms of being socially committed.

Keywords: Temporary Shelters; Disaster Related to Rainfall; Human-Centered Design; Furniture and Equipment; Product Design.

1. Reflections on the sites. Temporary or permanent?

An unprecedented number of people have been accommodated in temporary shelters due to natural disasters. What are the implications of this fact?

The rudimentary level of facilities, inadequate spaces and struggles to meet everyday basic needs affect a significant part of human dignity. The reconstruction of everyday life in private places brings to light collective confrontation with embarrassing situations at a moment when the person is emotionally unprepared to face them.

The sites where shelterless camps are installed have a transitory character, reiterated by faith in reconstruction. The spatial arrangements are determined by the occupations which can move from temporary experiences to permanent ones and vice versa.

Categorizing shelters as temporary or permanent generates inaccurate terms, since the occupation circumstance overlaps as it combines thoughts of legality, resistance, freedom and organization. For Charlie Hailey, in informal settlements the unstructured space underscores the value of gathering (Hailey, 2009). The author expatiates on the idea that

the sites where camps are installed can be understood as spaces for change: adapted to various uses, in transient moments, creating a climate of debate and invention. In disaster situations, forced displacement from their homes once regarded as permanent to temporary housing may violate rules. Disasters destabilize permanent housing.

Paradoxically, Dr. John Murlis suggests that it is not the time for significant changes of standards to which they are accustomed. His opinion should be considered, as he has outlined principles which have certain universality regarding the possibility of application in disaster situations to the designers, based on the most successful conditions. He believes human context determines that familiar aspects should be restored. It is possible to satisfy requirements such as religious worship that recurrently calls for a makeshift temple or place to accommodate people gathered in order to relieve their distress (MURLIS, 1977).

In contrast, the state of emergency extended by disaster recidivism destabilizes the temporary accommodations, which can become fixed. In instances where the reconstruction of housing exceeds six months, housing in temporary shelters becomes more permanent than temporary.

In other cases, as Gustavo Caminati Anders study on emergency shelters reveals, in situations when portable and prefabricated buildings provided for temporary situations exceed the previous standard of living of the population sheltered, there is a propensity for these people to settle permanently in these shelters. This creates a new expectation which forms a

^{*} Contact Author: Lara Leite Barbosa, PhD Professor, University of São Paulo, address: Rua do Lago, 876 CEP 05508-080 São Paulo, SP – Brazil Tel: (55) 11-3091-4535 Fax: (55) 11-3091-4546 e-mail: larabarbosa@hotmail.com

permanent settlement later turning into slums (ANDERS, 2007).

2. Presentation of the research and its methodology

The Temporary shelters adopted as mitigative measure are insufficient and sometimes inadequate. Given the quality of spaces and products for the shelterless, the research on which this article is based focuses on a furniture and equipment design development proposal for emergency situations. During the first two years of this research, studies and data collection will be carried out and will provide the framework for the preliminary design, involving a collaborative participation of a flood affected shelterless group. In the third and fourth years of this research, experimental verification of model tests and assessments will be conducted. The research aims at developing studies to obtain product design requirements for rehabilitation practice in temporary shelters, minimizing the adverse consequences of disasters. The results of this project will be analyzed according to parameters related to sustainability.

The development of this interdisciplinary project counts on the contribution of two working groups: GIS-RB-Geographic Information System of the Ribeira do Iguape and Southern Coastline regions, sponsored by the Ribeira do Iguape and Southern Coastline Hydrographic Basin Committee (UGRHI-11) whose members are geologist Professor

Arlei Benedito Macedo, PhD, biologist Fabrizio Bau Dalmas, MSc, and NEPED (Center of Studies and Social Research in Disasters), coordinated by Professor Norma Felicidade Valêncio from the Sociology Department of UFSCar (São Carlos Federal University), who contributed in the initial stage of this proposal to The Young Investigators Awards.¹ The partnership of the author, who is the researcher responsible, with the associate researchers was established from studies of common interests in the Brazilian town of Eldorado, especially by the current project "Survey and Monitoring of Risk Areas in UGRHI-11 and Support for Civil Defense", sponsored by the State Water Resources Fund. The alliances have strengthened the integration of the researchers in the local community with the already established contacts with the city hall of the tourist city of Eldorado, the CRAS-Reference Center for Social Services and the Head of Civil Defense, Edson Barbosa Ney.

The research will be conducted according to methodologies related to the development of industrial products design. These are divided into stages: Preliminary Study, Conceptual Design, Project

Production, Production Monitoring, Assessment and Detailing of the project (BAXTER, 1998).

In order to obtain project requirements, we will perform the initials stages of data collection and analysis. After assessment, the project will be developed, which will try to meet the perceived needs with the collaborative participation of a group of flood affected shelterless people.

The methodology for the development of the project is based on the method used by IDEO, one of the leading design centers around the world. Focused on innovation, the method suggests strategies for designing products based on people's understanding, experiences, behaviors, needs and perceptions. Divided into four categories, which correspond to the ways rapport is established, the method proposes: learning, seeking, asking and testing. Aiming a human-centered design, the stages of creation are distinguished by identifying information which corresponds to the real wishes of what man wants with that object.

The techniques of this method will be adapted to the research on flood affected shelterless people. The psychosocial dimensions which affect people involved in disasters are part of the concerns investigated by the NEPED (Center of Studies and Social Research in Disasters) research group, coordinated by Professor Norma Felicidade Valêncio from the Sociology Department of UFSCar (São Carlos Federal University) and will be used as reference in the development of this research.

The project will be carried out in collaboration with researchers associated with the GIS-RB and the Geosciences Institute of USP to find possible deployments and installations of temporary shelters and other facilities needed in disaster response, considering the territory probably affected by the disaster as well as in works of mapping and data processing of our survey. The GIS-RB is based in the city of Registro, São Paulo, in the premises of DAEE (Department of Water and Power), a fact which is quite relevant to the local support in the outskirts of the city chosen for the field study.

For the testing of constructive alternatives, model studies will be built on the University of São Paulo campus, in the city of São Paulo, with the laboratory infrastructure of the Technical Section of LAME-Models and Tests, coordinated by Paulo Eduardo Fonseca de Campos. The laboratory provides adequate machinery for such activities as carpentry, metalwork, painting booth, working with resin and ceramic and the assistance of qualified technicians in handling different materials such as wood, plaster, cork, plastics, fiberglass, clay, metals, etc. According to the model's complexity, it is still possible to obtain support from companies which are committed to the scope of the proposal and with which we can work in partnership throughout the project development, for

¹ Research Project "Emergency: Furniture and Equipment Design for Temporary Shelters to Groups Affected by Disasters Related to Rainfall", File FAPESP number 2011/ 50007-6.

example, manufacturers of stainless steel components for industrial kitchens.

3. The case of the city of Eldorado, São Paulo, Brazil

The theme of climate change has been the focus of worldwide discussions and concerns. In Brazil, the most prevalent natural disasters in each region are: forest fires and floods (North), droughts and floods (Northeast), forest fires (Midwest); mudslides and flash floods (Southeast), floods, windstorms and hail (South). (Available at <http://www.defesacivil.gov.br/> Accessed March 17th, 2009).

The National Civil Defense Department, which seeks to minimize human, environmental and material damages when a disaster strikes, presents data which confirms the vulnerability of certain cities to flash floods, mudslides and floods in Brazil. Among the disasters reported to SEDEC & MI in the years 2008 and 2010, we highlight the prevalence of natural disasters related to the increase in rainfall and floods in cities of different states in Brazil. We have also noticed that there is a growing vulnerability of small towns in dealing with the ravages of floods. After considering alternatives and current occurrences in Brazilian cities (preferably in the State of São Paulo) open to visitation and data collection, the city of Eldorado, with approximately 11,000 inhabitants, was chosen as the venue for the case study due to a series of factors which enable the development of the research, such as:

- Recurrence of flooding that often dislodge its population. Heavy rains struck the region in the years 1954, 1965, 1973, 1983, 1987, 1990, 1995, 1997, 1998, and 2010;
- High potential for rainfall-type front, with high intensity and duration, which leave the city in a situation of imminent flooding;
- Need for urgent action because Ribeira River floods annually generate losses from the flooding of homes and businesses, loss of agricultural production and traffic disruption and the loss of human life²;
- Good relationship with the mayor and other administrative bodies, which were open to proposals and visits from researchers.

In the city of Eldorado		In the city of Registro	
Month/Year	Flow (m / s)	Month/Year	Flow (m / s)
Jan/97	4.261	Jan/97	2.782
Jan/95	3.061	Jan/83	2.476
May/83	2.573	Jan/95	2.214
May/54	2.455	Feb/47	2.144
Feb/98	2.279	Feb/98	2.058
Jan/90	2.184	Feb/46	2.010

² Data from the report “Ribeira do Iguape Hydrographic Basin – Action Plan Summary Report”, produced by the Department of Water and Power (DAEE) in October 1998.

Table 1: **Largest floods in the Ribeira Iguape Hydrographic Basin.** Source: 1993 and CESP DAEE CTH in CBH-RB, 2007, pp.387.

4. Spatiality of the temporary shelters: a participatory experience.

According to the Municipal Civil Defense Coordinator (COMDEC), in the latest flood of January 27, 2010, seventy-five flood affected shelterless people were referred to the Community Center in the city of Eldorado, located at Avenida Karaite - Downtown, and ten other people were accommodated in their relatives and friends homes. The flood of January 1997, the largest ever recorded to date, left about 15,400 flood affected shelterless people.

Taking this data into consideration, we have observed a large contingent affected by disasters. The existing temporary shelters not always have the capacity to accommodate so many people. Alternative emergency measures supplement the facilities offered by the Civil Defense, by Governmental Agencies, NGOs and charities in general.

Existing equipment used in emergency situations have a high manufacturing cost and difficult transportation, lack food safety standards, need specialized maintenance, need non-autonomous power, water and sanitation systems, and are not adjusted to different implementation situations. It is worrying that in temporary shelters for environmental disasters victims, deaths are caused by food poisoning due to low sanitation control ³. Norma Felicidade Valêncio, coordinator of NEPED (Center of Studies and Social Research in Disasters), reported incidents of violence perceived in various temporary shelters across Brazil⁴.

Carefully trying not to turn people who experience disasters into mere counts, we seek to learn about the everyday life of flood affected shelterless people. The collective experience of uncertainty in this context requires an adjustment to new conditions in a territory that does not belong to that individual. Even more uncomfortable is the situation of the elderly suffering from dementia, the handicap or people with restricted mobility, pregnant women, among others. Often, the absence of surveillance or monitoring of coordinators, as well as lack of privacy in the shelters, lead to acts of violence such as rapes, fights, robberies and theft, affecting the already fragile shelterless

³ According to data from Ministry of Health Surveillance Agency (Information and Technology Division at SUS, Single Health System). Available at <http://w3.datasus.gov.br/datasus/datasus.php>

⁴ During a lecture in the Seminar “Strategies for Reducing Natural Disasters in the State of São Paulo” held by the Geological Institute, Environment Protection Agency on December 8th, 2010.

people. These situations could be avoided through proper use of space and adequate equipment.

In this sense, the training workshop "Participatory Methodologies Focusing on Water-Related Disasters" was held on December 18th, 2010 in the city of Eldorado, organized by NEPED. According to two local social workers report, along with the already shelterless population, we discussed the core values to decide where to lodge people according to the specific needs of each one. Rescuing the memory of what happened in 1997 and other years, the group recalled how families were grouped and how the organization of temporary shelters in the Eldorado Community Center was, assembling the interactive model.

In this activity, the social workers reported problems in the building used as a shelter: the shelter is poorly ventilated and rainwater comes into. While opening the doors would fill in the space that could house a family, the first thing was to keep the gates open to dissipate some of the heat.

Except for the worst case that occurred in 1997 when even the mayor and his team, the head of civil defense and the military police, were shelterless, in general there are 8-9 families to be lodged in temporary shelters. As you increase the number of families to be lodged, conditions of comfort in the shelter are reorganized and renegotiated. Because it is a small city, many people are related or have stronger ties, so relationships among them are identified to bring families with certain affinity to the shelter.

Partitions walls were placed when the number of shelterless people increased, in other cases, the cabinets brought by people divided the spaces. People with restricted mobility as the elderly and pregnant women (a large group in the city) were accommodated near the kitchen and the bathroom; the ones with infectious diseases must be isolated from the kitchen, children were grouped around the television and in spaces where they could play.

A communal laundry on the outside of the building was built. However, in cooking chore, for example, we could notice that Brazilian mothers prefer having their own stove and being individually responsible for the provision of food for their families. Just as what happened in Eldorado: at first it was a communal meal, but soon several people brought their stoves to the shelter and began fixing their meals. People took their belongings they managed to recover and these were stored near the communal laundry outside due to the limited space. In cases of overcrowding, besides the Community Center, the church had to provide shelter for people as well.

As it is a recurrent problem, people get organized when flood is forecast: they pick up their belongings and move to shelters. Unfortunately, not only the aspect of personal life is affected, but the city's economy, with overwhelming losses.

We conclude that the training workshop is a great resource for rethinking the rules at the shelter and it

helps new equipment projecting. This support gives evidence to the attitudes, the rules for spatial distribution and the values which motivate the choices contemplating human dignity. It is vital to establish an environment of mutual trust and friendship among people who share the same space. The impetus of solidarity decreases possessiveness when individual objects are replaced by communal uses. Some habits are preserved, but others may be altered and, therefore, everyday life is changed to strengthen relations of respect in the shelter.



Figures 1 and 2: Interactive Model in the Community Center. Representation of spatial ownership of the building commonly used as temporary shelter in the city of Eldorado.

5. Analysis of solutions for rehabilitation practice in temporary shelters.

When it comes to mobile architecture creativity and a possible utopia are encouraged. Several authors cited in this article repeatedly believe in the possibility of renewal of behaviors, habits and customs for the ephemeral proposals. The issue is attractive to students and architects who see an opportunity to work on new construction techniques of materials manufactured with a low cost challenge. We received calls from a growing number of international contests to design temporary shelters. Since 1999, through Architecture for Humanity, Cameron Sinclair has undertaken a series of initiatives to stimulate architects to participate in social project contests and activities, especially in disaster relief⁵. Unfortunately, as Dr. John Murli alerts, few prototypes have been built, since almost no project suits the actual conditions of disasters (MURLIS, 1977).

We should note that this research is in its initial phase and data collection with the social groups mostly vulnerable to the impacts of events associated with rainfall has not been carried out. Therefore, the solutions studied here only contribute to

⁵ Available at <<http://www.architectureforhumanity.org>>
Accessed 01/08/2007.

understanding the types of projects available for immediate relief in floods.

5.1 The emergency kit *Shelterbox*.

In Brazil, the equipment to be used as emergency shelter which has been broadcast is *Shelterbox* emergency kit, donated by Rotary Club. The product was distributed during the floods that occurred in the Brazilian cities of the states of Santa Catarina in 2008, Pernambuco and Alagoas (400 units); and in the cities in the state of Rio de Janeiro as Nova Friburgo, Petropolis and Teresopolis (1,200 units) and São José do Vale do Rio Preto (150 units) in 2010.

From the donation of £590, Rotary Club provides one *ShelterBox* per family hit by a disaster. *ShelterBox* Brazil is headquartered in São Caetano do Sul, in the Greater São Paulo. The box which is lightweight and waterproof is closed in the city of Helston, Cornwall, England. According to the site, the kit consists of a tent, cooking utensils, cutlery, children's pack, accessories and survival equipment. Only new equipment is delivered, selected for durability and practicality.

Manufactured by Vango, the tent accommodates a family of up to 10 people and is designed to withstand storms and extreme temperatures. For cooking, a small stove, utensils, cutlery, pans and mugs. For children, crayons, pens and drawing books are offered in order to entertain them in such a difficult moment. As thermal protection, depending on the location of the disaster, the kit includes various fittings. Where low temperatures, thermal blankets and insulated ground sheets. In places of high temperatures, mosquito nets and water purification means are supplied, especially where malaria and tropical epidemics are prevalent. Basic tools such as hammer, ax, saw, trenching shovel, hoe head, pliers and wire cutters enable the shelterless population to improve, construct or repair their immediate environment.



Figure 3: **ShelterBox**. Components. Image available at: <http://www.shelterbox.org/about.php?page=9> Accessed February 18, 2011.



Figures 4 and 5: **ShelterBox**. Occupation of territory in the Teresópolis Exhibition Center, where around 600 tents were put up Images available at: <http://www.shelterbox.org.br/sbb/meoclube.site#location1> Accessed February 18, 2011.

Bureaucracy made donation difficult as informed by the chief operating officer of *Shelterbox*, John Leach: "Historically, it has been extremely difficult for *ShelterBox* help Brazil, even when there was an obvious need."⁶ In addition to a look-see at the families that must urgently be addressed, help is needed in delivery logistics. When 1,200 units were sent to the Brazilian cities of Nova Friburgo, Petrópolis and Teresópolis, the air and ground transportation of the kits was conducted by the Brazilian Air Force. In a report signed by the general coordinator of *Shelterbox* Brazil, Conrad Orsatti, queues for shelters were longer than the ones for food. The situation refers to what happened in the Brazilian city of Barreiros, between Pernambuco and Alagoas states, in June 2010, when people were accommodated in buildings which were not destroyed, such as churches, bus stations and even under trees when there were no more places to stay.

6. Redefinition for a socially committed architecture.

Why are we surprised when we notice the presence of design in places considered as "unexpected", when it is actually where the urgent intervention of a designer resides?

New public policies that are in tune with the needs of the people involved can be formulated. An example would be transparency in the relationship between public institutions and the shelterless. Public accountability should be available so that all the resources allocated to aid the processes of reconstruction or distribution of donations on behalf of the shelterless can be tracked by citizens.

What rules can we consider, up to a certain extent, to improve welfare in this temporary situation?

One of the few scholars on emergency architecture, Ian Davis, mapped observations in other countries that may still be useful (DAVIS, 1980, pp. 138).

- The use of camping tents is an effective, immediate and well-accepted solution, assuring safety and grouping;
- The tendency of people to compare with their original homes;
- The importation is more expensive and slower than the construction site;
- The imported model of prefabricated houses is not well accepted by local populations;
- Intermediate housing, such as pre-fabricated, meets the social need of being a family, but the investments required in its maintenance force people to stay in shelters while rebuilding their homes.

The construction of housing for disaster situations is classified as unnecessary and undesirable by Ian Davis. For him, it can be replaced by the provision of emergency shelters in parallel with the reconstruction of the houses.

In Robert Kronenburg's opinion, future residents could be involved in creating and building these facilities. The author agrees with the attitude of social workers from the city of Eldorado, since it should respect the previous family group organizations, as well as special provisions for the sick, the elderly and children. Personal belongings and memorabilia which can be saved in the accident provide a little comfort in this difficult moment. For him, the building should be an investment that, if portable, reusable and enough useful life, will be used and relocated as permanent housing for the refugees themselves (KRONENBURG, 2002).

We hope this article instigates new approaches which can contribute to minimize the chaotic state of temporary shelters. And that strategic planning can replace those expensive and inappropriate measures when accommodating shelterless families.

7. References

- ANDERS, G. C. **Abrigos temporários de caráter emergencial**. São Paulo: FAU.USP, 2007. Dissertação de mestrado.
- BAXTER, M. **Projeto de produto – guia prático para o desenvolvimento de novos produtos**. São Paulo: Edgard Blücher, 1998.
- CBH-RB Comitê da Bacia Hidrográfica do Ribeira de Iguape e Litoral Sul. **Relatório de Situação dos Recursos Hídricos da UGRHI 11**. Registro, CBH-RB, 2007.
- DAVIS, I. **Arquitectura de emergência**. Barcelona: Gustavo Gilli, 1980.
- Defesa Civil. Available at:
<http://www.defesacivil.gov.br/> Accessed on March 17th, 2009.
- HAILEY, C. **Camps. A guide to 21 st-century space**. London: The MIT Press, 2009. pp.1-19.
- KRONENBURG, R. **Houses in motion. The Genesis, History and Development of the Portable Building**. London: Academy, 2002.
- MURLIS, J. **The role of the designer in disaster relief**. In: BICKNELL, J.; MACQUISTON, L. (ed.) **ICSID Design for need. The Social Contribution of Design**. An anthology of papers presented to the Symposium at the Royal College of Art, London, April 1976. Oxford: Pergamon Press, 1977. pp.54-63.
- VALÊNCIO, Norma; SIENA, Mariana; MARCHEZINI, Victor; GONÇALVES, Juliano Costa (org.). **Sociologia dos Desastres; Construção, Interfaces e Perspectivas no Brasil**. São Carlos: Rima, 2009.
- Rotary International. Available at:
<http://rotary4750.blogspot.com/2010/06/equipe-da-sheletterbox-vai-para-inundacao.html>. Accessed on February 18th, 2011.
- Shelterbox. Available at: <http://www.shelterbox.org/> Accessed on February 18th, 2011.