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ABSTRACT

The topic of humanitarian design – or even humanitarian architecture – appeared a little over one hundred years ago and is now an essential discussion for the 21st century. What challenges must we face in order to use design to further improve areas affected by disasters? That is the question this article seeks to answer, and is based on research that started in 2010 and continues today through the APIS Project. It entails a design project featuring a modular bathroom that fits inside a container so it can be transported to disaster areas. In the current stage, a prototype of the module is being built, which will be adapted for testing with people temporarily sheltered in public buildings, such as schools and gyms, in a municipality in Brazil's Ribeira Valley that is recurrently affected by floods. It includes sustainability aspects since it proposes treating and reusing graywater, and also uses low toxicity sealing components made with local materials. The project's methodology is therefore a collaborative one, grounded in the design thinking methodology that requires the formation of multidisciplinary teams in order to deal with the high complexity of design problems intrinsically related to disasters. The contribution of this paper emphasizes the values of resilience, focus of the global campaign of the United Nations International Strategy for Disaster Reduction, UNISDR, aiming to increase the levels of awareness and the commitment to sustainable development practices, while reducing vulnerabilities and providing wellbeing and safety to citizens.

Keywords: Humanitarian design, resilience, sustainability, modular bathroom, disasters.

HUMANITARIAN DESIGN: SINCE WHEN?

The adjective 'humanitarian' designates the quality of making a commitment to the welfare of one's fellow human beings and humanity as a whole. This philanthropic practice is triggered by a sense of sympathy that leads to helping others, regardless of political or religious motivations. At first, this may be the role of every designer in our society, but, generally speaking, the public attended to by the designer is a select one that is usually not very much in need.

"Design is essentially a middle class bracket society profession and has been contributing to enhancing the wellbeing and comfort in the lives of people in this very same bracket. It is also a value-added asset for the upper class. However, most people lack not only middle class comforts, but also the basic means of survival: adequate shelter, food, education, and medical care" (Margolin, 2014, p. 50-51). Victor Papanek already warned designers in the early 1970s about the importance of including, when developing products, the social needs of third

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world communities and people with disabilities or limitations, such as the elderly (Papanek, 1973). What differentiates humanitarian design is its choice of where to act, or more specifically, for whom the designer will make his or her contribution. In this sense, designing and producing objects, equipment, structures, transport and buildings in zones destroyed by disasters becomes a much welcomed action. Architect Cameron Sinclair confirms this intention when he states that the focus of Architecture for Humanity, a charitable organization he founded in the US in 1999 with journalist Kate Stohr, is "to seek architectural solutions for humanitarian crises and bring design services to communities in need" (ARCHITECTURE FOR HUMANITY, 2006, 11). With similar aspirations, the following organizations focus on this same specialized work: the United Nations High Commissioner for Refugees (UNHCR), the United Nations Human Settlements Programme (UN-Habitat), the America Red Cross, CARE International, Oxfam GB and Rotary International, among others. They provide help in developing and implementing emergency shelters, housing or equipment in the event of disaster, whether natural or man-made.

Successive wars and catastrophes such as earthquakes, tsunamis and floods have been increasing over the last 100 years. If we were to count as from the First World War (1914-1918) and consider the number of cities and infrastructure destroyed, plus the populations and homes hurt or damaged, there wouldn't be any doubt as to the enormous amount of work there is to be done. At that time, the League of Nations began as an international organization focused on promoting peace between the nations. During the San Francisco Conference at the end of World War II in 1945, the United Nations Charter was signed, thus creating the United Nations. Although UN interventions in situations of natural disasters were already taking place during the 1960s, it was only in the 1970s that social actions started to occur. In this sense, the creation of the United Nations Disaster Relief Office (UNDRO) in 1971 was a milestone. The emphasis has changed over the decades, and in the 1990s one of the main concerns was how to reduce the impacts of natural disasters. Again there was a need to change strategies and approaches, and the concepts of vulnerability and risk have been introduced to the discussion about disasters. In 2000, *The United Nations International Strategy for Disaster Reduction (UNISDR)* was established, covering countries on five continents. Today the focus of the UNISDR's global campaign is on resilience. The goal is to increase the levels of awareness and the commitment to sustainable development practices, thereby reducing vulnerabilities and providing wellbeing and safety to citizens. In Brazil, the UNISDR has been promoting several initiatives in conjunction with the National Secretariat of Civil Defense, the Pan American Health Organization (OPAS, for its Portuguese acronym), and different ministries, such as the Ministry of Foreign Affairs and Ministry of National Integration.

CHALLENGES WE MUST FACE IN ORDER TO USE DESIGN TO FURTHER IMPROVE AREAS AFFECTED BY DISASTERS

For those in design, interfacing with those who need their problems solved is not always direct. The designer may start his job separate from the end user, as per requests by institutions. There is much to learn about the other before any intervention initiative. What is thought to be essential for a community after a disaster might not be so crucial, and vice versa. "People act more conservatively than normal," said Ian Davis, one of the pioneers of study in this field. The professor compared premature diagnoses based on myths about the affected populations with real situations. While one could imagine that people would be

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passively waiting for help after the disaster, what happens is quite the opposite: an instinctive survival behavior motivates them to seek solutions to their problems (Davis, 1978).

Recapturing the famous line by Charles Francis Richter, inventor of the eponymous scale for measuring the magnitude of an earthquake, "Earthquakes don't kill people, buildings do," we realize this is the truth. This statement warns about the responsibilities of architects and engineers, and shows the other side of the proximity their creations have with people, which can bring about disastrous consequences.

Knowledgeable on these issues, Japanese architect Shigeru Ban wrote a letter to the UNHCR during the civil war in Rwanda, Africa, in 1994 and offered his proposal for a constructive system made from cardboard tubes for shelters. "It turned out that one of the pressing issues at refugee camps during that time in Rwanda was deforestation, which quickly evolved into an environmental problem. This was caused by more than two million refugees resorting to cutting trees down for the completion of their shelters because UNHCR was only able to provide 4 x 6 meters of plastic tarps to them. As a reaction, UNHCR supplied aluminum pipes, but this backfired since aluminum was expensive in Africa and the refugees sold them to make money" (Ban, S.; Keio University SFC Ban Laboratory, 2010, p. 7). People's reactions to building their own shelters are, most of the time, as unpredictable as the disaster itself. A stroke of luck may unite a need to replace conventional materials with an unconventional material that the architect was developing. This is how Shigeru Ban started providing consultancy in humanitarian design, ultimately being awarded the 2014 Pritzker Prize twenty years later. This short history narrates the complexity of design proposals in situation where preserving human life is of the utmost importance, but where meeting social, economic, environmental and technical requirements is also key.

So if we want to use design to help in such situations, what challenges must we face? The research presented here shows some of the challenges that permeate the organization of temporary shelters based on a case study conducted in Brazil. There are shortages of resources, delays in reconstruction actions and difficulties in managing the shelter. "Ideally, the administration of a temporary shelter must meet a set of provisions that refers to physical protection, a place of rest, and the provision of food, clothing and medication until a lasting solution is implemented by the State" (Valencio, N.F.L.S.; Marchezini, V.; Siena M. 2008, p. 7).

Very particular psychosocial aspects are intrinsically linked to the condition of an individual being temporarily housed in an adapted place just when he or she is in extremely upset and emotional state. However, the issue of vulnerability is not only the individual's personal crisis after the disaster, but a crisis of the social context. Human intervention in the environment in increasingly intense ways has raised risks that have become a part of our daily lives. They are no longer seen as "accidents" or exceptions, but are being addressed as something increasingly normal because of their recurrence. Norma Valêncio states that the term "risk zone" features biased speech that blames the poorest for their inability to deal with the dangers that surround them (Marchezini, 2014).

Among so many weaknesses, the design of temporary shelters should not limit itself to the materiality of the built environment, but reinforce the symbolic aspects of the land. Privacy is a factor that must be considered, with attention not only to visual shields, but also to auditory and olfactory elements. Sharing

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spaces should be examined in order to group people with affinities, and, if possible, members of the same family. Safety is another important factor inasmuch as acts of violence such as rapes, robberies, assaults, often aggravated by alcohol or drugs, do occur in shelters. Although a temporary solution, the assistance is not limited to basic human needs. Subjective needs such as feeling useful and able to help others or maintaining family cohesion in a tragic situation can be stimulated by the type of architectural solution chosen. The design solution may provide components that can be assembled by the people left homeless, or may have the flexibility to allow different layouts according to the number of people who will occupy the place.



Figure 1 – Lack of privacy in the adapted temporary shelter in the Parish Hall of Chapel Cristo Rei in Ilhota, Santa Catarina state, Brazil (Photography from the Neped Collection, 2008).

THE IMPORTANCE OF BUILDING AS A RESPONSE AND A REHABILITATION ACTION AFTER DISASTERS

To discuss these issues, the research project initially entitled "Emergency Design: Furniture and Equipment Design for Temporary Shelters for Groups Affected by Disasters due to Rains" has been conducted at the Design Department of the Faculty of Architecture and Urbanism FAUUSP since its author's entry as a teacher into the University of São Paulo in November of 2009. The proposal addresses, in an unprecedented way, a case study on interventions in Eldorado, a municipality with about 15,000 inhabitants, located in the Ribeira Valley, southern region of the State of São Paulo, a place where the lowest Human Development Indexes (HDI) of the states of Paraná and São Paulo are found, thus reinforcing the difficulties that the municipalities have in restructuring after disasters.

The main goals of the research are to design and test several three-dimensional physical models, carry out the construction of a modular bathroom prototype, and then test it with the population. The proposal is for hygiene facilities divided into three spaces: a mixed-use area for people with special needs, and two gender-segregated areas with showers, toilets, and external sinks. The

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THE VALUE OF HUMANITARIAN DESIGN: THE CASE OF THE APIS PROJECT

Lara Leite Barbosa

bathroom fits inside a container that can be transported on Brazilian roads to disasters areas and installed in a location near the existing temporary shelter. It will be used during the period of sheltering, supporting the population in their daily hygiene activities such as bathing and brushing their teeth, as well as providing people with a place for their physiological needs, such as urinating and defecating. As the region in question, the Ribeira Valley, is affected each year by recurrent floods, the period for which the population stays in shelters varies from seven days to one fortnight. Tests on the bathroom's performance will be conducted with those sheltered in public buildings such as schools, churches and gymnasiums, which are commonly adapted as temporary shelters in small municipalities affected by floods. This research is focused on temporary issues, so long term solutions are not discussed in this paper. The possibility of relocating families to safe places, removing them from risk areas, depends on government housing initiatives, such as "My House, My Life" Programme (in Portuguese 'Minha Casa, Minha Vida - MCMV').



Figure 2 – Flooding which occurred in August 2011, affecting about 1,500 homeless and 6,000 left homeless in Eldorado, in the Ribeira Valley (Photography by the Press Office of the Municipality of Eldorado, 2011).

Since November of 2013, the research project has received the support necessary to create the prototype. This same project then adopted the name APIS – Emergency Bathrooms for Situations after Disasters Due to Rains, and was ranked one of the seven (7) university finalists to participate in the Pillars of Sustainable Education program in an international selection created by the Architecture for Humanity and funded by the Alcoa Foundation (<http://pillarsofsustainableeducation.org/university-of-sao-paulo>). It is an international program that supports community-based university design projects that explore innovative uses for sustainable materials, granting funds for construction. The following universities participate in this initiative: Carnegie Mellon University, T U Delft and OWL, Georgia Institute of Technology, Purdue University, Tsinghua University, and the University of São Paulo. The research focuses on issues of sustainability since it proposes the treatment and reuse of graywater, and also uses low toxicity sealing components made with local materials. The project explores different uses for a material widely available in

THE VALUE OF HUMANITARIAN DESIGN: THE CASE OF THE APIS PROJECT

Lara Leite Barbosa

the area of study: banana fibre. From the point of view of sustainability, using local resources lessens the impact on transport and facilitates the acceptance of the material by the population since it is something they are culturally familiar with.

Because of the complexity of producing the model, we may still look for the support of companies committed to the scope of the proposal and with whom partnerships can be established throughout the project's development. In this way, we have a partnership with ALCOA for the execution of the prototype and we intend to establish other partnerships with suppliers of other pieces of equipment, such as the manufacturers of toilets, showers and wash basins in Brazil. Thus, we intend to supplement the budget with new businesses that support the project. To experiment with constructive possibilities, we plan to build study models at the FAUUSP campus in São Paulo, using the laboratory infrastructure of the Technical Department of Models and Tests, LAME, for its Portuguese acronym. To execute and assemble the prototype, we requested a site from the experimental construction site at FAUUSP.

Prototyping a humanitarian proposal goes beyond its scientific purpose because without something physically constructed, there is no good to offer the community. When architect Cameron Sinclair takes stock of what she experienced at her non-governmental organization for about twelve years, she lists ten lessons, with the first being: "Unless you build it, it doesn't matter" (Architecture for Humanity, 2012, p. 12). This sentence emphasizes how the community perceives the intervention of the designer. Regardless of how beautiful the drawings or three-dimensional models are, humanitarian significance only comes into existence when materialized and delivered to the community as a product.

The Collaborative Methodology of the APIS Project

The growing trend of including the user and even the workers in the creation process in a participatory or collaborative manner is part of a social, political, environmental and ecological engagement in design interventions. An important methodological point of reference on integrated design is Victor Papanek, who cherished the values of designer decentralization and sought to incorporate the human foundation in the design process (Papanek, 1983). In the literature of design, he is one of the authors who spent his entire life trying to make people a part of the design, not only in their role as end users, but more so to include them in decision-making prior to the perception of demands. He attributes several errors in products to the fact that designers are distant and unaware of who will benefit from their creations.

This project would never advance if it were conducted in isolation or developed within the scope of a single faculty. This makes it interdisciplinary and gives it the support of sponsors, suppliers, consultants specializing in various subareas, and research institutes for testing and certifications. Since the beginning, the research has been conducted with the participation of the community and the local council, members of civil defence and non-governmental organizations, and university researchers. The methodology for this project is a collaborative one; it is grounded in design thinking methodology, which requires the formation of multidisciplinary teams in order to deal with the high complexity involved in solving design problems that are intrinsically linked to disasters.

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To achieve the desired results, the research group NOAH - Habitat Center without Borders, created and led by the author of the article in partnership with other units from the University of São Paulo such as the Institute of Geosciences and the Polytechnic Faculty, has been conducting collaborative workshops inspired by design thinking methodology. The research conducted by these groups deals with the stages of Preparation, Response and Rehabilitation, and are introduced in the Center for Research Support (*Núcleo de Apoio à Pesquisa, NAP*) and in the Center for Studies and Research on Disasters of the State of São Paulo (*Centro de Estudos e Pesquisas sobre Desastres do Estado de São Paulo, CEPED*).

In efforts to collect project data not solely from academic sources, we created workshops where we invite researchers from other faculties and areas of knowledge, local town hall officials, and residents who had already been left homeless by previous floods. On December 9th, 2011, we were able to diagnose the needs of emergency shelters and specify requests in disaster situations, together with the people who participated in the first NOAH workshop: *Participatory Experience with People left Homeless due to Rains*. Analysis of the information generated by the meeting indicated three types of desirable designs: partitions made from vegetable fibres for existing shelters; temporary toilets for collective use; and the study of new Shelter Centers for the disaster period. In the Cultural Village on August 5th, 2012, the second NOAH workshop: *Collaborative Dynamics for Project Design in Eldorado* was held. The activities were geared towards a discussion of solutions and verifying the acceptance of the participants regarding the collaborative concept as a strategy that will enable the execution of the project. Throughout 2013, preliminary design of the selected equipment – a mobile bathroom to serve the existing shelters – was developed. The selection of this project as a topic of priority was one of the results of the second workshop. "On the occurrence of the flood of August 2011, there was little or no water available for personal hygiene. That available was not heated for bathing. The lack of privacy made us uncomfortable during activities such as dressing" (Barbosa, LL; Takushi, CY; Carli, LLS, Kawasaki, BC, 2012, p. 8).

In the already completed initial phase, (studies and surveys conducted between 2010 and 2013), we start from the assumption that the "users," that is to say the people left homeless, are the center of the design process, and we collect their opinions and information at the participatory workshops. It was at this time that the function and characteristics of the equipment were defined.

In the current phase (development of preliminary design - 2014), we continue to review the design, considering the variables the survey has identified: we added local materials and sustainability characteristics that we found in similar design projects, tailoring them to the specifications of the partnerships being formed. It is from that stage on that this proposal starts, refining the design according to the feasibility of building a prototype.

In the next phase (experimental verification - 2015), our goal is to produce knowledge on the assembly and disassembly processes. There will be a trial project with the construction of three dimensional models and intermediate tests to check how the proposals are functioning.

In the final phase (tests, assessments and final analyses - 2016 and 2017) the prototype will be taken to the town of Eldorado where we intend to finally test the proposals with people recurrently left homeless. Reviews of the project and reports on its success will be made.

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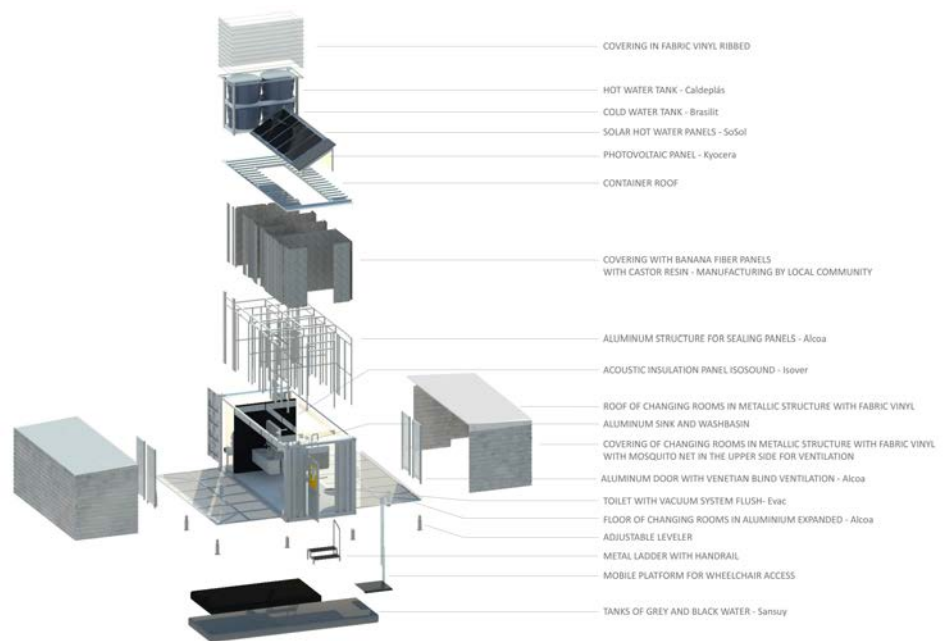


Figure 3 – Exploded view of the APIS Project (Drawing of the NOAH Collection, 2014).

VALUES OF RESILIENCE FAR BEYOND THE SUM OF ITS PARTS

Thus, the proposal of integrating several collaborations for the project as a whole does not boil down to the simple sum of its parts. The research presented illustrates how design emerges from a complex system of players who interrelate and change the final result. The design process focused on the response and rehabilitation phases after natural disasters is marked by constant redefinitions, since every moment brings new data on legal, economic, social and even psychological responsibilities that have to be considered.

Resilience, according to the Merriam-Webster dictionary, is the ability to become strong, healthy or successful again after something bad has happened. It can also be understood as something's ability to return to its original shape after it has been pulled, stretched, pressed, folded, and so on. Thus, the integration of various professionals such as archaeologists, historians, engineers, architects, designers, agronomists, administrators, economists and sociologists and their specific contributions is a way of generating knowledge for interventions in disaster contexts.

The values of resilience that have been disseminated by the UNISDR 2010-2015 global campaign, *Making Cities Resilient: My City is Getting Ready*, intrinsically bring up the concept proposed by Aristotle where "the whole is more than just the sum of its parts." The campaign proposes "ten steps" that local governments must take to make their cities more resilient to disasters. Each step is part of a larger planning process for reducing disaster risks that influence urban development plans and projects.

To exemplify how the campaign addresses the inclusion of the affected population when defining needs, we highlight the tenth step, where we find the following recommendation:

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"Essential 10: After any disaster, ensure that the needs of the survivors are placed at the center of the reconstruction, with their support and support from their community organizations in designing and helping implement responses, including rebuilding homes and livelihoods" (UNISDR, 2012, p. 54.).

Ultimately, the impact of a disaster can transcend into an opportunity to rebuild the community with improvements, enhancing their development and reducing the risks that were present from the outset. Even more than that, these relationships provide innovative results. Ezio Manzini calls a group of people who act collaboratively to solve problems "creative communities," and this form of organization generates promising new possibilities (Manzini, 2008). Seeing the need of the designer to rethink his role and *modus operandi*, the innovations resulting from the process proposed by this research change not only the scenario affected by the disaster, but everyone involved: residents, managers, professionals and researchers. The exchange of knowledge between individuals is beneficial for all because it allows direct access to the players involved in the realization of the idea. It generates social innovation, as defined by Manzini: "changes in the way individuals or communities act to solve their problems or to create new opportunities" (Manzini, 2008, p. 61.).

This study's contribution can be applied in research on organizations and collaborative methodologies once the design process seeks the inclusion of people in the collaborative workshops mentioned in this article. This inclusion increases the likelihood that the community will feel a part of the project and can stimulate their desire to care for the intervention when it is ready.

Anthropometry studies, such as those conducted by Henry Dreyfuss in 1960, showed that design should consider their users as individuals and not under a universal standard. An even more sensitive look at the differences existing among the people who will use the object created by the designer should look beyond typologies such as children, the elderly, men, women, single, married. Nowadays there is a growing concern over a more realistic design practice that considers social changes and new ways of life. However, these approaches have not been applied when designing for disaster situations. Given the immediacy following a disaster, when generalized donations come in after the media has sensationalized the tragedy, we propose the principles of inclusive design to better match those affected by disasters. We know that the challenges are numerous, as are the problems mentioned for the direct engagement of the users - "from time and cost to recruitment, and important to the process itself - how to do it" (Coleman, R.; Clarkson, J.; Dong J, H .; Cassim, J ., 2008, p. 232).

Finally, the article aims to aid in studies in the field of disasters, given the difficulties in finding information on local case studies with an interdisciplinary approach, especially in Brazil. The APIS Project is an experiment in progress on humanitarian design that seeks to unite and apply several different twenty-first century themes: sustainability, resilience, inclusive design and collaborative methodologies.

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Lara Leite Barbosa

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