"Always design a thing by considering it in its next larger context - a chair in a room, a room in a house, a house in an environment, an environment in a city plan."

1 Eliel Saarinen

The focus of this thesis falls within the parameters of rapidly deployable shelter systems. The shelter form will ultimately be determined by the structure type and method of construction.

This chapter is a critical revision of flat-pack deployable structures. Precedent studies were selected accordingly to gain an overall understanding of the diversity of applications that are both temporary and transitional.

Architect and shelter advisor Elizabeth Babister uses the example of her Transitional Community project in Sri Lanka to describe the difference between temporary and transitional:

These are ‘transitional’ as opposed to ‘temporary’. Emergency shelter is temporary and is intended just to provide shelter for survival. Transitional implies something that is longer-term and gives you space to carry out livelihood activities rather than just surviving.

7.1 OVERVIEW OF PRECEDENT STUDIES

Table 01 shows a wide range of available sheltering options. South Africa currently employs the uses two: the UNHCR light-weight emergency tent and military canvas tents [centre pole and ridge type].

The discussion of precedents ranges from the very general to the specific. This order seemed to be the most logical. The chapter starts by explaining four different concepts derived and explained at the hand of different precedent studies that propose an alternative approach to shelter. These concepts are to be further challenged and explored in the chapters to follow.

It then continues with a critical revision of the main influences that contribute to the synthesis of the proposed solution.

1 Fletcher (2001)

2 Babister was the shelter advisor for the Transitional Community project in Tangalle, Hambantota, Sri Lanka, 2005. Architecture for Humanity (2007/99)
### Shape, Size and Construction

2a. The tent is semi-circular or tunnel shaped with centre height of 210 cm, width of 300 cm and length of 550 cm.

2b. It consists of two full layers or double fly i.e. an outer shell and an inner tent.

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>103</td>
<td>Uber Shelter by Smith (2007)</td>
</tr>
<tr>
<td>104</td>
<td>Lifeboat Shelter Pods by Cleland (2008)</td>
</tr>
<tr>
<td>106</td>
<td>Sustainable cardboard shelter by De Acon (1999)</td>
</tr>
<tr>
<td>107</td>
<td>Better House Project by Bergen Architects (2009)</td>
</tr>
<tr>
<td>108</td>
<td>Global Village shelter by Global Village Shelters Ltd (n.d.)</td>
</tr>
<tr>
<td>109</td>
<td>Lifeline Emergency Shelters/Parkinson (2007)</td>
</tr>
<tr>
<td>110</td>
<td>Octagon Shelter by Sago Mukasa (n.d.)</td>
</tr>
<tr>
<td>111</td>
<td>UN Plastic Shelter by United Nations (1985)</td>
</tr>
<tr>
<td>112</td>
<td>UN Canvas Military Tents (2009)</td>
</tr>
<tr>
<td>114</td>
<td>Floatable Public Bench Shelter by Y. Yang (2007)</td>
</tr>
<tr>
<td>115</td>
<td>Cocoon Emergency Shelter by Moriarty (2007)</td>
</tr>
<tr>
<td>116</td>
<td>Octagon Shelter by Sago Mukasa (n.d.)</td>
</tr>
<tr>
<td>117</td>
<td>UN Plastic Shelter by United Nations (1985)</td>
</tr>
<tr>
<td>118</td>
<td>UN Canvas Military Tents (2009)</td>
</tr>
<tr>
<td>120</td>
<td>Ma-Ori Shelter by Shigeru Ban Architects (2008)</td>
</tr>
<tr>
<td>121</td>
<td>Low Tech Balloon System by TechnoCraft (1999)</td>
</tr>
<tr>
<td>122</td>
<td>Dome Village by C. Chamberlain (Architecture for Humanity, 2006)</td>
</tr>
<tr>
<td>123</td>
<td>Deployable Geoshelter by <a href="http://www.deployablegeoshelter.com">www.deployablegeoshelter.com</a></td>
</tr>
<tr>
<td>124</td>
<td>De-Crush Shelter by <a href="http://www.deplasableshelter.com">www.deplasableshelter.com</a></td>
</tr>
<tr>
<td>125</td>
<td>Folding Shelter by Schipper (2008)</td>
</tr>
<tr>
<td>127</td>
<td>Limnic Eruptions by Cancino (2007)</td>
</tr>
<tr>
<td>129</td>
<td>Dome Village by C. Chamberlain (Architecture for Humanity, 2006)</td>
</tr>
<tr>
<td>131</td>
<td>Folding Shelter by Schipper (2008)</td>
</tr>
<tr>
<td>132</td>
<td>reCover Shelter by Malone (2008)</td>
</tr>
<tr>
<td>133</td>
<td>Floating Public Bench Shelter by M. Rakowicz (Architecture for Humanity, 2006)</td>
</tr>
<tr>
<td>134</td>
<td>Doca Autumn table by Lassanen (2007)</td>
</tr>
<tr>
<td>135</td>
<td>Low Tech Balloon System by TechnoCraft (1999)</td>
</tr>
<tr>
<td>136</td>
<td>Dome Village by C. Chamberlain (Architecture for Humanity, 2006)</td>
</tr>
<tr>
<td>137</td>
<td>SHELL house by Pino (2007)</td>
</tr>
<tr>
<td>138</td>
<td>Hyve by Pinsky (2007)</td>
</tr>
</tbody>
</table>
7.2 CONCEPT PRECEDENTS

The conceptual thinking of the proposed shelter is best explained at the hand of the following precedent studies:

CONCEPTUAL DERIVATIVE 7.2.1

In relation to the thesis topic this concept presents a promising idea that one could either have shelter or one could have furniture. It provides a flexible situation wherein, no matter what, one would always have what one needs most.

CONCEPTUAL DERIVATIVE 7.2.2

Proposes that elements evolve as the time line of recovery increases. This would require more permanent components with flexible applications.

CONCEPTUAL DERIVATIVE 7.2.3

Provision of a partially complete shelter that encourages completion with materials of the user’s choice.

CONCEPTUAL DERIVATIVE 7.2.4

The development of cardboard as a viable building material has come a long way. This marks the first ever cardboard building to be built. It met very strict UK building codes and fire regulations and has a life expectancy of 25 years.

7.2.1 ADAPTABILITY

House of Furniture Parts

LOCATION: Via Alserio, Milan
DATE: 2009
DESIGN FIRM: Studio Makkink and Bey
MAJOR FUNDING: As part of the development of Droog Studio’s Staircase project for their New York store.

DESCRIPTION:

A fun element used to create a small space within larger office or public spaces. Dezeen Magazine describes it as:

Enclosure made of plywood and with walls of stool, bench and table parts that easily come out and assemble, the functionality and character of the house can be changed as more or less furniture is used. A poetic vision for efficient production and material use, House of Furniture Parts transports flat and can be made to suit different functions, produced locally and customized.

The versatility of end uses that the concept can be adapted for are endless. All materials and processes are locally manufactured.

Figure 139 Milan 2009 - House of furniture parts for Droog Studio Makkink & Bey (2009[1 of 5])
7.2.2 EMERGENCE

Water shelter

LOCATION: Zambezi basin in Sub-Saharan Africa
CLIENT: UNHCR and NGOs in Mozambique and Zambia
USER: Displaced residents of Dodanduwa, Sri Lanka
DESIGNER: Robert Nightingale
MAJOR FUNDING: UNHCR and NGOs in Mozambique and Zambia

DESCRIPTION:

The design meets four basic needs: shelter; drinking water; transportation and product information; promoting healthy behaviour by recycling water through its roof construction. The topic of emergences is supported by a three phase strategy:

(a) Transit: temporary tent structure for habitation whilst travelling to safer area.

(b) Transition: after arriving at the final destination the design allows the incorporation of local materials to increase in size and volume.

(c) Rebuild: the design becomes a structural template for future construction.

7.2.3 TRANSITION

Safe[R] House

LOCATION: Sri Lanka
DATE: 2005
CLIENT: Prajnopaya Foundation
USER: Displaced residents of Dodanduwa, Sri Lanka
DESIGN TEAM: Harvard Graduate School of Design, Senseable City Laboratory, Massachusetts Institute of Technology [MIT]
MAJOR FUNDING: Architecture for Humanity, Prajnopaya Foundation
COST PER UNIT: $1,500
AREA: 37 sqm

DESCRIPTION:

The Saferhouse was designed to resist the force of a tsunami. It replaces the core of the house with four C-shaped concrete structures. These core structures are what was of interest as they allow the occupant to complete their dwelling with their own choice of materials and style.

This slight modification of traditional building techniques helps communities build their homes back safer which is a very important longer term goal.

7.2.4 ALTERNATIVE MATERIALS

Westborough Primary School

LOCATION: Westcliff-on-Sea, Essex, UK
DATE: 1999-2002
CLIENT: Westborough Primary School
USER: Displaced residents of Dodanduwa, Sri Lanka
ARCHITECT: Cottrell & Vermeulen Architects, UK
ENGINEER: Buro Happold
QS: Buro Happold
CONTRACTOR: CG Franklin Building Ltd.
CONTRACT VALUE: £177,157
AREA: 91 sqm
LIFESPAN: 20-25 years

DESCRIPTION:

The project marks a breakthrough for cardboard as a viable building material. The collaborative approach between built environment professionals, the client, manufacturers and other research partners resulted in a building constructed of 90% recycled and recyclable materials.

Inspired by origami the project successfully encapsulated the structural properties inherent to folded paper structures.
7.3 FLAT PACK SHELTER

7.3.1 Global Village Shelters

LOCATION: Grenada
DATE: 1995-2005
USER: Displaced residents of Grenada
DISASTER: Hurricane
DESIGN FIRM: Feraara Design, Inc.
MAJOR FUNDING: Architecture for Humanity; Weyerhaeuser, Inc.; Ed Plant; and other individual donations.
COST PER UNIT: $400
AREA: estimated 6 sqm
LIFESPAN: 8-12 Months
DESCRIPTION:

More than a 100 different experimental forms were designed before finding the right method for this design.

Made from laminated corrugated cardboard, the hut can be erected in less than an hour by two people using only a set of diagrams and common tools.\(^8\)

The shape relates to the archetype of a typical western house and it remains questionable whether the design is suitable to the context it was designed for.

\(^8\) Architecture for Humanity (2006:74)

7.3.2 Niigata Paper Shelter

DESIGNER: Shigeru Ban Architects

DESCRIPTION:

Shigeru Ban has long been using of cardboard in his designs. The design is made up from square cardboard tubes and was developed after the Niigata earthquake to be an internal shelter allowing privacy in the large spaces used to house those affected by the disaster.

7.3.3 Hexayurt

DESIGNER: Rocky Mountain Institute

DESCRIPTION:

This modern interpretation of the classic Central Asian nomad housing uses modern materials, such as insulation board, to create a shelter that can be easily assembled for disaster relief in developing countries. The design has been worked out so to minimal cutting is required of the materials and the components can be assembled simply with tape.

7.3.4 Octagon

DESIGNER: Sago Mokuzaï, Japan

DESCRIPTION:

This deployable shelter comprises of a series of precut cardboard panels that slot together to form an octagonal dome. The shelter is transported flat pack in two boxes weighing 40kg each. Once assembled the boxes used for transport can be cut and used as a floor covering. The shelter is kept dry through the use of reflective waterproof membrane and is estimated to last for 6 months.
reCOVER Shelter

DESIGNERS: Matthew Malone, Amanda Goldberg, Jennifer Metcalf and Grant Meacham

DESCRIPTION:

The shelter is designed for rapid deployment in disaster relief. It is said the 100% polypropylene structure can be erected in minutes by one person. This seems highly unlikely as it is rather large and made from a single sheet. Structural stability, ventilation, fire retardancy and ground sheeting elements are not addressed. It is however highly adaptable to various environments and its flexibility in transport and configuration has merit. The shelter can be folded into a flat sheet for shipping, or collapsed into a horse shoe shape.

7.3.5 Ha-Ori Shelter

DESIGNER: Joerg Student of IDEO

DESCRIPTION:

The Ha-Ori shelter was created by Joerg Student for his masters at Royal college of Art. Developed from nature (hornbeam leaf) the folds and rigid structure of the leaf started to develop ideas of a collapsible shelter. It is made from one sheet of polypropylene which is folded into the designed shape. Roughly 2.4 feet high when folded out and weighs 36 Kg makes it easy to transport.

7.3.6 Shell House [living portable]

DESIGNER: Open Architecture Network

DESCRIPTION:

SHELLHOUSE-[living portable] is a collapsible, recycled cardboard shelter for homeless people. The idea is to provide mobile communications to those who do not otherwise have access to peer contact. Each shelter comes equipped with a radio device providing the occupant with a portable address.

This design displays an innovative use of low tech and temporary elements.

7.3.7 Schipper

DESIGNER: Daniel Schipper, Netherlands

DESCRIPTION:

Origami inspired folding shelter made from misprinted milk packaging. Tetrapak is very durable compared to raw cardboard and can therefore have a longer life span.

7.3.8 Extreme Housing

DESIGNER: Deborah Gans, Matt Jelacic, Philadelphia

DESCRIPTION:

Gans and Jelacic have looked into Extreme Housing for people displaced in many forms. Using an array of materials from lightweight structural ceramic foam to bamboo. This scheme, completed for the Transitional Housing competition, describes a reconstituted house using a ruined wall.

The volumetric units / pods

7.3.9 Red + Housing

DESIGNER: Obra Architects

DESCRIPTION:

Red + Housing incorporates both the advantages of fast-response solutions with that of transitional solutions.

The design adheres to ‘10 points of architecture on the edge of survival’ put forward by the design team: universal application, effective performance, economical, transportable, ease of assembly, renewable materials, digital pre-fabrication, open work, urban/rural application and flexibility of use.
Almost immediately after the event of a disaster the sheltering process starts with elements that shelter the body: bandages, blankets, clothes, etc. The process of recovery begins with humble elements that grow to define interior space, even before the exterior shell is inhabited.

Kronenburg\(^9\) explains that “we rearrange objects and possessions because it helps us establish a sense of place.”

This sense of place is one of the many intangible losses experienced by displaced individuals. Seemingly simple objects can become an important step in the recovery process through arrangement, adaptability, flexibility and change.

As is often the case with emergencies, anticipated volume exceeds capacity and thus a product is proposed to mediate between such situations by utilising limited space more effectively and providing the displaced with much needed privacy.

EMOTIONALISM: COGNITIVE PATH OF PRODUCT

In the last section of this chapter precedents are selected to investigate the importance and cultural significance of surface in interior architecture.

Emotionalism is an important part of what drives our consumerist society, it is often emotion that determines whether or not to engage with an object. Designed products connect emotionally with the end user are usually assigned a high value.

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\(^9\) Denzel (2008:1)
\(^10\) Kronenburg (2002a:20)
7.4.1 R. Lopez de Heredia winery

**DESIGNER:** Zaha Hadid

**DESCRIPTION:**
An elegant example of how structural elements come to define the interior atmosphere. The wall carries through function to become shelving and storage.

7.4.2 Kid’s Republic bookstore

**DESIGNER:** SKSK Architects, Beijing

**DESCRIPTION:**
Kids Republic is a children’s bookstore in Beijing. The innovative use of colour cultivate an atmosphere of curiosity and play.

7.4.3 + The Portananos

**DESIGNER:** Mark Sapetti, Spain

**DESCRIPTION:**
Although not collapsible or deployable the wooden chapel remains under the portable category as it is made up of prefabricated plywood panels, allowing the structure to be dismantled and reassembled at different locations.

The simple yet delicate addition of a plywood tree motif provides the structure with the ephemeral qualities becoming of a meditative space.

7.4.4 desFURNITURE

**DESIGNER:** desFurniture Group

**DESCRIPTION:**
desFurniture11 likes their pieces to: “push the boundaries of efficiency while maintaining craftsmanship.”

Many of their designs originate from a single sheet of plywood using no fasteners, adhesives or tools. Such principles are ideal for emergency situations where tools and assembly skills are limited.

7.4.5 Doca Autunno coffee table

**DESIGNER:** Italy

**DESCRIPTION:**
This flat pack table from cardboard made from two sheet. The table uses the principles of origami to fold together without the need of any tools.

7.4.6 +The Portananos

**DESIGNER:** Mark Sapetti, Spain

**DESCRIPTION:**
The Portananos is a lightweight crib for babies up to six months. Made from recycled cardboard the flat pack principle allows for easy transport and assembly.
7.4.7 Disposable Cardboard Bed

DESIGNER: Nikolay Suslov, Russia

DESCRIPTION:
A cheap and disposable bed made from corrugated cardboard sheet, and treated with a waterproof substance. It folds up and is easy and light to carry.

When in the reclined position the bed is 20cm high, successfully keeping the user away from the cold floor.

7.4.8 Itbed

DESIGNER: Design It, Switzerland

DESCRIPTION:
The bed frame consists of foldable triangular sections that can be flat packed for storage and unfolded when needed.

Made from 7mm thick corrugated cardboard it serves as simple application of the basic structural properties of cardboard.

7.4.9 Das Original Pappbett

DESIGNER: Stange Design, Berlin

DESCRIPTION:
A complete flat packed product that sets up into a bed base from precut and scored elements. Designed in such a way that allows for extra storage space, with the option of purchasing accompanying roll out drawers.

The application of folded elements provided a sturdy and reliable long term solution.

7.4.10 Chair of Textures

DESIGNER: Tjep

DESCRIPTION:
Chair made out of layers of stainless steel, laser cut and folded to the user’s discretion.

7.4.11 A collection of Pillows

DESIGNER: Maja Ganszyniec, Poland

DESCRIPTION:
A collection of pillows in various shapes and sizes with holes and cut outs. The design was inspired by the unique and different way every individual sleeps.

The design takes a very mundane object and makes it very personal and encourages play.

7.4.12 Red + Housing chairs

DESIGNER: Obra Architects

DESCRIPTION:
Plywood chairs were designed to join together like puzzle pieces. The fabrication method allows for detailing assembly details directly on chairs.
7.1.1 Wallpaper Games:

DESIGNER: 5.5 designers, France

DESCRIPTION:
Referred to as ‘expression surfaces’ the wallpaper provides the canvas for spontaneous interaction, encourages play allowing the each space to take on a unique character depending on the colour pens used.

7.1.2 Wallpaper Games: Maize

DESIGNER: 5.5 designers, France

DESCRIPTION:
Wallpaper maizes.

7.1.3 Do Frame tape

DESIGNER: Martí Guixé.