NEW WAYS TO DESIGN IN EMERGENCY
A SUSTAINABLE APPROACH TO REFUGEE CAMP DESIGN

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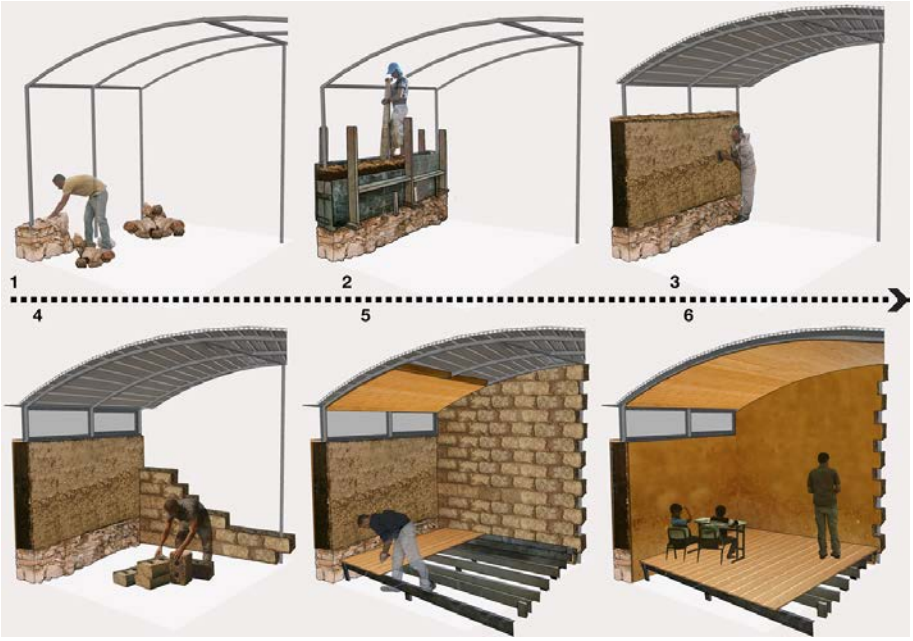

Fig 1: Improvement of an emergency structure in Ramadin Al Janub, West Bank. Design by: ARCò.

WHICH ARE YOUR ARCHITECTURAL (R)SOLUTIONS TO THE SOCIAL, ENVIRONMENTAL AND ECONOMIC CHALLENGES OF TODAY?

Research summary

Today's conflicts and natural disasters force people, more than ever, to leave their homes and search for shelter out of their familiar environment. The displacement generates lots of pressure, not only on people, social structures or the humanitarian community, but also on natural resources and the environment. This is why the proposed paper aims to promote an ecological approach to the conception of refugee camps. In a crisis situation, displaced communities need to search for and establish themselves in a new territory in an extremely short period of time and with the constraint of leaving everything behind. This circumstance leads us (architects) to look for solutions that will consider and combine community's knowledge and culture, local and external materials, and the ecological context in which the camp is hosted. Our main purpose is to imagine a development scenario where not only environment is not damaged, but also plays an active role in the sustainable growth of the camp. This will ease the development of a durable solution and make the community resilient to its previous state. Within the paper we start by establishing a requirement: That for different ecological areas different solutions must be found, according to available resources and the capacity of the territory to support human settlements. We believe that ecological diversity can promote a new way to conceive refugee settlements, promoting their integration in the environment.

Keywords: refugee camp, ecology, transitional settlement, resilience, low-tech, sustainability

1. Introduction

Although the need for unified guidelines for refugee camp planning had been made clear since the 1970's, culminating in the redaction of UNHCR's first *Handbook for Emergencies* (1982), the same cannot be stated for the interest towards environmental issues.

Environmental Guidelines (UNHCR, 1996) is the first document that attempts to integrate the environment in the design manual body. It acknowledges a certain gap in UNHCR's own documentation, stating that guidelines often regard environmental issues suggesting *ad hoc* measures or sectorial advices, in any way failing to frame the problem in its complexity. The utility of a common framework is explained via a consequential link: Environmental damages caused by unwise camp design lead to loss of natural resources, which eventually turns against refugees' well-being (UNHCR, 1996, p. 2). Therefore, the manual stands as a tool for damage limitation given that '*elimination of all adverse impacts is an impossibility, but their mitigation is a reasonable policy objective.'* (UNHCR, 1996, p. 3). Advices include design and management guidelines and a few practical advices (e.g. to follow site's contour lines to lay out camp structure, and recycle rainwater for vegetable garden watering), but no numerical standards. This is not a chance, as also the contemporary reference manual has a qualitative orientation, including only six quantitative standards (UNHCR, 1982).

The second (2000) and third (2007) edition of *Handbook for Emergencies* mark an important change of course to guidelines provision. The introduction of a substantial set of standards shifts the discourse from qualitative to quantitative terms. The same can be said about Sphere Project's *Humanitarian Charter and Minimum Standards in Humanitarian Response* (2011), even if both documents acknowledge the possibility that some standards might not be met in every situation, and so need to be used with flexibility (UNHCR, 2007, p. 210; Sphere, 2011, p. 240). Although their intent is to serve as a *mean* for good camp design, it has been pointed out how they have become in time a ultimate *goal* instead, resulting in the standardization of humanitarian action (Kennedy, 2008, p.121). This has often had very unpleasant effects. Kilian Kleinschmidt, former director of Jordan's Za'atari camp, has blamed the standardization of aid response for the severe security problems occurred in the settlement (Kleinschmidt, 2014), which led to several injuries amongst refugees, aid workers and policemen, and the unfortunate death of one refugee (BBC, 2014).

The lesson learned is that there are various kinds of needs and so there must be different ways of meeting them according to different situations. Everybody can agree that one person needs at least 2100 kcal and 3 liters of water a day to survive (Sphere, 2011, p. 228, 98). However, less tangible needs like space and services should be object of in-depth assessments on users' cultural profile.

The environmental question stands ambiguously in this context. How can we standardize integration in the ecosystem? The quantitative approach is doomed to overlook all the organic elements an ecosystem is made of, because they are difficult to quantify. This may trigger a vicious circle where the environment turns against refugees, already affected by displacement and impersonally regarded as numbers. Proven the social and environmental unsustainability of this approach, we should aim at defining a new design process towards the integration of the camp in its host environment, that is the main prerequisite of any organic settlement.

2. Research objectives

Recently, a research branch has developed with the precise goal of unifying the design approach of refugee camps, especially concerning environmental issues.
EnneadLab, a research firm active in the field, has been working on a parametric approach to emergency settlement planning (Ennead Lab, Stanford University, & UNHCR, 2014). The workflow consists in different steps and addresses different scales and phases. It can be basically summarized as follows: To a first assessment of specific site features, that function as input parameters, follows the production of a formal response. The outcome design adapts to the physical structure of the surroundings, as the latter has been considered as input for the design process. We acknowledge this approach a great potential, because it takes into account some of the components the environment is made up of. This somewhat protects the environment from being overridden by camp structures.
Drawing from this point, our proposals aims at including social structures and camp design guidelines in a process grounded on the environment, regarded as ecological system. To do so, not only physical structures, but also climatic and environmental aspects have to be taken into account. Moreover, the way they interact with the social and cultural matters has to play an important role as well. This in particular seems to be a capital issue. Not only disregarding cultural individuality can lead to disastrous effects (like Za'atari's episode cited above demonstrates), but we can also point out good design episodes resulting from taking those issues into account. One paradigmatic example is Bengali refugee camp of Khulna, built in response of 1973 floods and design by Intertect group, led by well-known camp planner Frederick Cuny. In this settlement, Bengali social and cultural habits, such as gender-based division of spaces and traditional house clustering, were taken as inputs to arrange the camp layout, together with health protection and sanitation measures. This helped creating a socially sustainable structure (Hartkopf & Goodspeed, 1979).
On the other hand, documents like SAFIRE & UNHCR's *Permaculture in Refugee Situations* (2001) open a window onto the ecologic approach, hoping for a sustainable integration between refugee community and host environment. The above cited manual clearly refers to the possibility of achieving harmony and naturalness through design (SAFIRE & UNHCR, 2001, p. 6). So our main challenge is to find a sustainable correspondence between an explicitly designed structure – the camp – and the much more organic social and environmental systems that interact with it.
Diverse options unfold in the long term. The camp can be dismantled, become a stable settlement for the refugees, or lend some or all of its structures to the use of local communities. In this paper, we will focus on the latter two options, thus assuming that camp structures will last in time.

3. Approach

Our proposal considers the environment both as back-up and resource for the settlement, the combination of its physical, ecological, and climatic features being the foundation of formal solutions. The main objective is to conceive all the elements needed in a camp from a more environmentally conscious perspective. Although an all-embracing tool, as described in paragraph 5, is yet to be tested, we believe that our general approach, as described in the following lines, can outline a good method for sustainable camp design. Our main thesis is that for different ecological areas

different solutions must be found, according to available resources and the capacity of the territory to support human settlements. This means that design must start from an assessment of all the available resources and environmental conditions, to define what technologies are suitable to that particular situation. Moreover, an analysis of social and cultural profile of refugees has to be carried out, in order to define formal rules that will guide the design process. This is of great importance, as the building will represent a resource for the environment only if it is also a resource for its users. Thus familiarity with social patterns and use of traditional techniques and materials are the main prerequisite of a successful design.
Besides, aware of how humanitarian aid is provided today and the amount of waste that its packaging generates, we think that recycling those elements in combination with local materials to build camps infrastructure becomes a key action. Future developments may also see relief items and packaging already designed to facilitate future re-assembly for construction purposes. Finally, resources are also regarded in a sustainable and local way, aiming at achieving independency from aid through the help of the ecosystem. In this sense, the environment can serve both as setting and resource to camp structures, allowing refugees to better integrate in the territory.

4. Results and design potential

In this paragraph we present three works that interpret in different ways the ecological approach described in the previous sections.
The first is Um Al Nasser children's center, built in 2011 in northern Gaza Strip for the local Bedouin community. This building stands as an example of how waste packaging and local materials can be combined to obtain sustainable solutions. Semi-nomadic by nature, the Bedouins were expelled from Be'er Sheva, Israel, and forced to settle in Gaza, thus can be regarded as displaced people.
The building aims at reinterpreting the traditional Bedouin tent typology, using low-tech but high-efficiency techniques that can be replicated in similar context by local communities. The tent is replaced by a double roof system which allows for wind cooling. The walls are made of plastic bags filled with compacted earth, an easy technique that could be easily implemented in refugee camps, combining bags from relief items packaging with earth resulting from site preparation works. Thanks to its thickness and earth natural properties, the envelope provides optimal insulation and thermal inertia, the latter being increased by the partially hypogeum position of the building.
The courtyard, which draws inspiration from Islamic typologies, hosts water tanks for rainwater harvesting and a bioswale for natural depuration. Sun contribution is also taken into account, as openings are arranged to obtain optimal natural illumination, and photovoltaic panels are placed on the curved roof for energy production.

Fig. 2: Construction of earth-bag walls for Um al Nasser children's center. Design by: ARCò, & MCA. Promoted by: Vento di Terra ONG.

Fig. 3. Courtyard in Um al Nasser children's center. Rainwater is collected by gutters, depurated and then stored in an underground tank. Design by: ARCò, & MCA. Promoted by: Vento di Terra ONG.

The second project is located in Ramadin al Janub, a small village in the West Bank. It is an example of how a temporary structure can be upgraded with local materials and simple technologies, becoming an efficient permanent building. In a way, this could be described as an entirely recycled building. The school was originally housed in simple temporary tents - no different than the average emergency shelter to be found in refugee camps - installed on a concrete platform. In the upgrade process, their steel structure was reinforced and reused as frame for the new rammed earth walls. Adding to this, partitions were built with locally cast bricks, and finished with plaster made of local clay and lime. The work is self-constructed, both with skilled and unskilled workers. The latter were instructed by simple construction manuals prepared in advance, which included a step-by-step construction sequence realized photographing a real-scale prototype. This helped developing a know-how that locals can apply to future situations. A training program of this kind could be easily implemented in refugee camps, where experienced personnel could share their knowledge with refugees. This would also reduce the impact of the transition from emergency to durable solutions.

Fig. 4: Ramadin al Janub's school being upgraded from temporary to permanent structure using rammed-earth technique. Design by: ARCò. Promoted by: Vento di Terra ONG.

Another similar situation, also in the West Bank, is the refurbishment of Abu Hindi's Bedouin school. In this case, external walls made of inefficient steel sheet were improved with the addition of a rammed earth layer, which allowed to dramatically increase internal climatic comfort. The earth and straw mixture was cast in a formwork made of wooden planks and bamboo sticks retrieved from near the building site. This low-cost and low-tech approach allows for easy implementation, and requires universal tools and materials. Even people with little construction skills – an ordinary scenario for a refugee camp – can be easily trained to apply these technologies to the improvement of shelter structures.

Fig. 5: Thermal efficiency improvement on perimetral walls of Abu Hindi school. Design by: ARCò. Promoted by: Vento di Terra ONG.

5. Future implementation

We believe that the practical approach described in the previous section can be structured to develop a flexible parametric tool. The workflow we imagine is as follows.
Considering the ecosystem as an under layer, we reduce its components to elementary geometry and then identify possible design uses those entities can serve, both in the short and in the long term. The elements to be considered are climatic (sunlight, wind, humidity, precipitations, temperature), physical (topography, geomorphology, hydrology), and regarding habitat (vegetation, soil composition). At the same time, an analysis is carried out on social, economic, and cultural patterns of the population to be hosted in the camp. Key factors are pinpointed and outlined as topological structures, so that patterns of space organization can be identified. Some of the key elements to be outlined are urban density and structure of refugees' native settlements, housing aggregation patterns, livelihoods activities and land use, religious-based or gender-based segregation customs. Adding to these, other patterns are brought out from manual guidelines, interpreting them as design rules rather than quantitative standards. There will be multiple factors, amongst these two groups, that influence each design address, and these are going to be grouped in a set of design patterns. This set is then applied to the geometries that result from the first environmental analysis, to create physical structures via an adaptation process.
The planning process is divided into four steps, according to the life of a camp, each one of which has an outcome solution (contingency plan, emergency solution, transitional solution, durable solution). This allows to consider different design orientations for each step, which will be described in the following paragraphs. The common thread is that each solution is grounded on both structures and effects deriving from the previous one. Moreover, environmental analysis occurs at every stage to make sure the camp integrates properly in its contexts, and that solutions can be adjusted thanks to incremental feedbacks.

5.1 Analysis and contingency plan

The goal of the first phase is to come up to a preliminary solution in response to an emergency that is yet to occur but likely to happen. Firstly, different sets of input are elaborated for different ecological macro-zones, thus taking into account macro-climate and macro-ecological features. Then, cultural and social patterns of the refugee population are considered, in order to define rules for formal design. As the emergency becomes more likely to happen, physical features of available sites are assessed, together with micro-scale climate and ecological characteristics. This all constitutes a set of inputs, that are put together into a contingency plan that includes formal outcomes. It is of great importance, at this stage, to focus on the evolution of the camp in the long term, in order to develop strategies to deal with external foreseeable stresses – e.g. population growth, damages to structures, resource shortage. Flexible solutions are preferred, and their adaptation to different scenarios needs to be tested.

5.2 Emergency Solution

In this phase, measures studied in the first phase are implemented on the chosen site. Speed and handiness are put first, in order to safeguard refugees' health to the extent possible. The ecological approach will assure that there will be as little negative effects on the environment as possible, and all the damages are reversible.

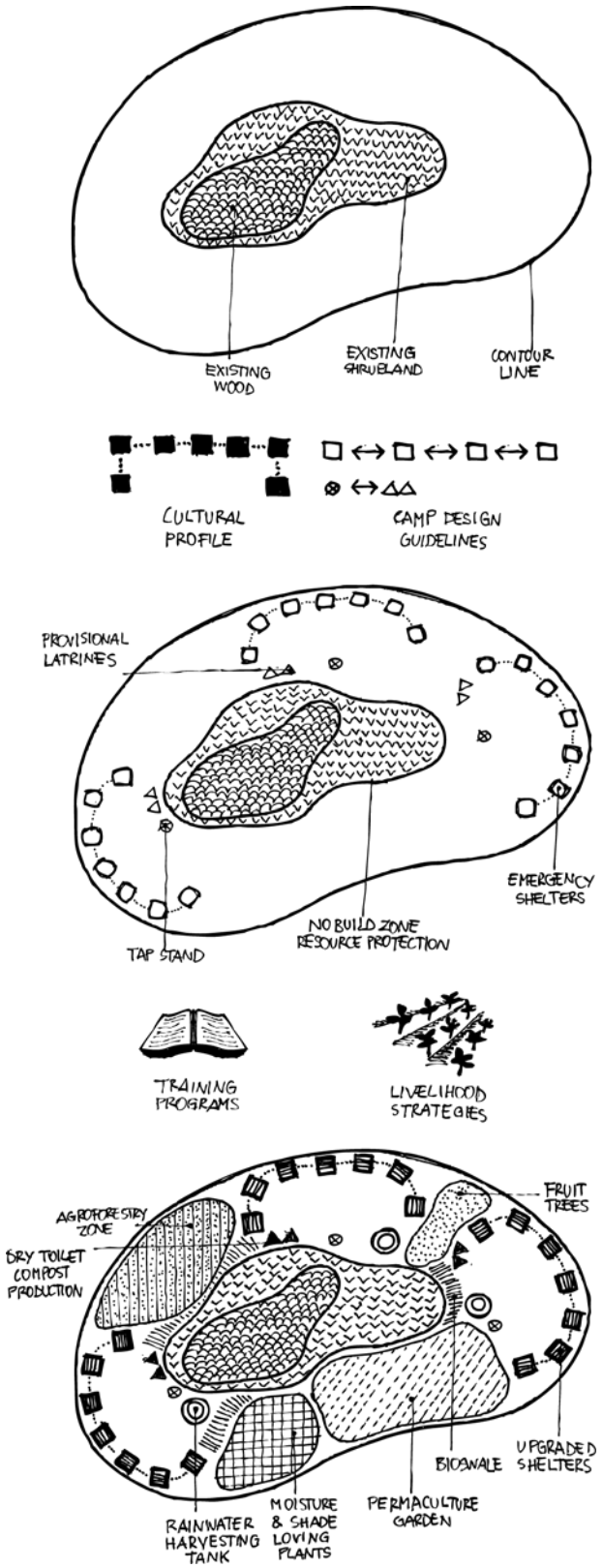

Fig. 6: Possible design strategies in the short and long term based on site's environmental features.

In the emergency phase precast elements and kits from NGOs are necessary when no other option is available to meet refugees' basic needs. Tents and caravans are allowed, as well as stand-alone electrical power generators, better if using sun or wind free contribution.

5.3 Transitional solution

At this stage the camp aims at starting a process that will lead to its integration in the social and environmental context. As it's been pointed out before, some modifications to the environment are not reversible, so a sustainable development is possible only if the emergency solution has taken into account all the analysis carried out in the first phase.

The end of refugees influx also puts an end to the emergency phase, allowing for a second assessment about available resources and needs for permanent structures in the camp. Long term solutions must be focused on the upgrade or replacement of impermanent structures with low-cost, self-built or self-assembled ones. As seen previously, recycling elements in combination with local materials can be a successful strategy, as aid items are highly standardized and so easy to assemble. Local labor, materials, and technologies are preferred for two main reasons. Firstly, to allow relief items to return to NGOs' stocks and be ready to serve other emergencies. Secondly, to provide socially compatible structures that allow refugees to develop a sense of belonging to the place.

The construction of permanent structures needs to go hand in hand with the setup of self-sustenance strategies and economic connections with local communities. The camp should be provided an office through which NGO's expertise can be transferred to refugees. This will help them deal with settlement development in the long term and raise awareness on environmental issues

concerning camp management. Training programs should be open to local communities as well, so that they can share with refugees their experience in dealing with the territory and benefit from external expertise.

5.4 Long term solution

In the long term the settlement takes root in the territory, developing as a self-sufficient organism. This can only be achieved by building a solid environmental awareness and practical skills to help refugees integrate both in the ecosystem and the host community.

In this phase, self-construction techniques can be implemented thanks to an improved know-how. Self-sustenance activities, developed in the transitional phase, also allow for refugees' autonomy from external aid.

6. Conclusions

As the projects previously presented show, good results have been achieved by applying ecology to design and construction. Our aim is to structure the experience coming from isolated cases, in order to develop a design tool that can be applied in a systematic way to refugee camp contexts.

Since refugee camps are continuously changing entities, the way they develop into real settlements raises a question on how to let this process happen in a sustainable way. Indeed, their complexity and relationship with the ecosystem asks for more than a damage limitation approach. We believe that different phases of this growth need to be addressed in different ways, using ecology as a common framework to embrace social and health aspects. Our ultimate goal is to provide a contribution to the camp design practice, which addresses camps' issues from an ecological perspective and thus can positively integrate UNHCR guidelines. Following the lesson of landscape ecologists such as Ingegnoli and Farina, our approach aims at promoting a design method that considers men – the refugees – as important as the system that gives them hospitality, and positive participants in its equilibrium.

7. Acknowledgments

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