ECOWEEK: The Book #1: 50 Voices for Sustainability

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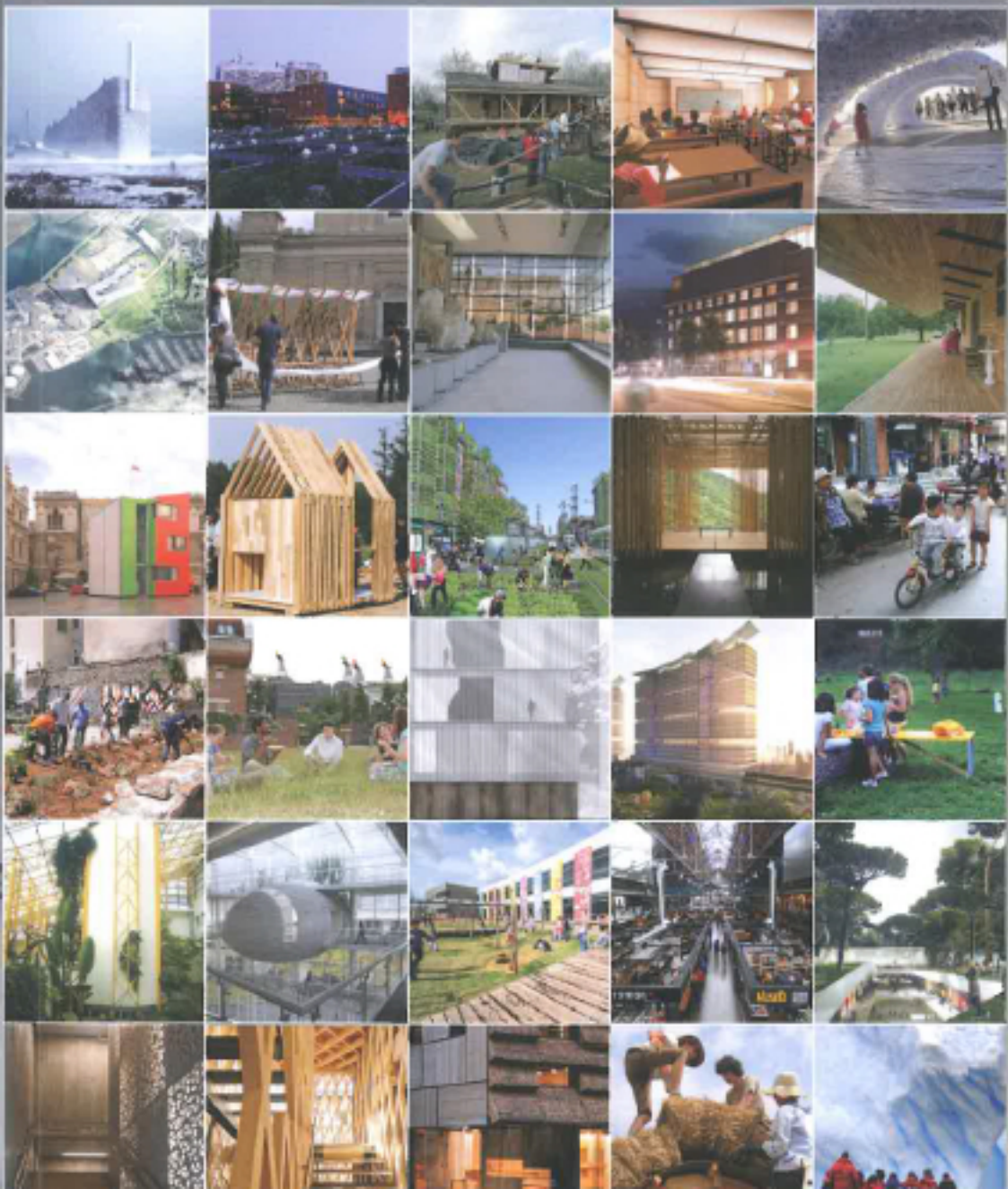
Foreword by David Orr



1, 2. *Al Khan Al Ahmar Primary School (Courtesy of ARCò)*

3, 4. *Al Khan Al Ahmar Primary School Section (Courtesy of ARCò)*

5. *Al Khan Al Ahmar Primary School Floor Plan (Courtesy of ARCò)*

6. *Al Khan Al Ahmar Primary School Structure (Courtesy of ARCò)*

7, 8. *Al Khan Al Ahmar Primary School (Courtesy of ARCò)*

Alessio Battistella (Italy) Architect, founder of ARCo group of engineers and architects, based in Milan. ARCo uses low–cost materials and sustainable techniques to develop particularly educational projects, in Palestine and Mozambique.

Alessio Battistella

Resilient Design - A possible approach to sustainable design in emergency contexts: A School in Al Kahn Al Ahmar, Palestine

Alessio Battistella

It is possible to define 'resilience' as the capacity of an ecosystem or a social system to continue functioning despite arbitrary changes to the internal equilibrium. Social systems and ecosystems are resilient if they can survive great mutations.

Resilience is fundamentally important when applied to the field of sustainable architecture. A new methodology to evaluate design could be based on understanding the resilience of a system.

Borrowing the analogy of social and ecological systems, the resilience of a system in sustainable architecture increases when the dependence on external energy is reduced. The input of large amounts of energy may increase the stability and minimize the fluctuations of a system, but it may reduce its resilience.

A resilient system must be highly adaptable. This means 'the capacity of social-ecological systems to adjust their responses to changing external conditions and internal processes and thereby allow for continued operation along the current trajectory.'

Based on the above assumptions, we can summarize that 'resilience is the tendency of a social-ecological system subject to change to remain within a stability range, continually changing and adapting yet remaining within critical thresholds.'

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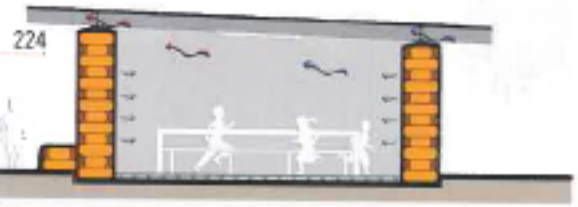

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As architects we need to design tools which can guarantee the stability of a system through continuous changes in the physical and social context of our work.

This definition becomes ever more critical when we operate in a context of social, environmental, and economic crisis.

Resilient design in this context can only be low-tech, because we cannot depend on a reliable supply of energy.

I believe that low-tech solutions ought to be proposed in response to the challenges of sustainable development in all built environments. Not only in crisis situations, or only in the so – called developing world.

Environmental sustainability must be measured not only in terms of the energy performance of a building, but in terms of its economic and social sustainability as well. It is important to keep costs low, involve local communities in construction and maintenance, and make sure the users take responsibility for their building by recognizing their own contribution in its architecture.

The design approach of the ARCò group is cooperation in all our architectural projects. 'Architecture and Cooperation' may best illustrate how we approach these challenges.

The point of departure for each project is always an actual need. It emerges during the first meetings and site visits.

ARCò is interested in a sort of 'architectural acupuncture,' inspired by the 'urban acupuncture' proposed by Jaime Lerner. How to generate a succession of actions and reactions triggering a virtuous cycle. Architecture becomes the starting point of a system and creates the opportunities for possible evolution.

The research is both urban and architectural

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and aims at a degree of user comfort and a reduced use of environmental and financial resources. The budgets of the projects have always been low, but these limits have become opportunities for innovation and creativity.

The extremely limited financial resources have led ARCò to experiment, and to try out new techniques, adapting and favoring construction methods which directly involve the population and encourage the sense of identity within the communities.

ARCò is not a charitable organization. Unlike many international aid groups that disperse aid in third world countries or areas that have suffered environmental disasters, our work is motivated by research, which we believe needs to be done onsite and within real situations of crisis. It could be seen as 'applied in-situ' research.

As part of this approach, appropriate instruction manuals are created for each project. These are necessary instruments of communication facilitate working with people who don't speak a foreign language and typically lack basic technical knowledge. We design a manual upon completion of a trial workshop led by ARCò group before reaching the crisis area.

The goal is to graphically codify the essential information and transmit it to the members of the local community. To empower them with the understanding of each phase of the construction process.

The idea of a manual is not new. A well-known excellent example is that produced by Enzo Mari: 'Autoprogettazione?' Mari raised the fundamental question about the management of the construction process as a way to share the design decision process.

An example of this methodology is the school located in Al Khan Al Ahmar in the West

Bank. One of the most important aims of the Arcò group intervention was to guide the inhabitants, the builders, and coauthors of the school. This was made possible through a manual that was coherent and precise, and through the transmission of the project to the local community. It was not a simple challenge, but a high priority for Arcò group.

The constraints we had to deal with were complex. The Palestinians have great difficulty obtaining building permissions from the Israeli authorities. This was one of the reasons for choosing a non-conventional material, so that it could not be defined as a 'permanent structure' by the authorities. Furthermore, speed and simplicity, minimum costs, and the use of local non-skilled manpower were critical. Lastly, the building had to address the extreme environmental conditions of the desert.

These constraints inspired an innovative project that managed to address all of these constraints – a school built with car tires.

We chose used tires filled with desert sand for several reasons: They cannot only be constructed rapidly and simply, but they provide high thermal insulation and have compressive strength as well.

Although bibliographic sources are limited for this methodology, we found enough inspiring examples to learn from. 'Earthships' were perhaps the first examples of buildings constructed with this technique. They were built in New Mexico under the guidance of architect Michael Reynolds. Reynolds' 'Earthships' are comfortable buildings of passive solar design, with south-facing greenhouses, water recycling systems, and integrated renewable energy sources.

Used tires were available in the West Bank at no cost. Tires are elastic and resistant to corrosion. Their internal woven iron threads make them durable and an ideal building material. The reuse of a material typically destined for the landfill, or in this case, to be disposed to the open landscape or to be burned unchecked, is also important. The sand packed tires offered stability, compressive strength, and thermal insulation.

Tires are stacked in overlapping layers as bricks, to form load bearing walls. The walls are plastered externally with a lime and clay plaster, which protects them from solar radiation. This prevents decomposition and release of any possible toxic gases to the interior of the building.

The sandwich panel roof is laid on a structure of wooden beams, protecting the building from extreme external temperatures. Natural cross ventilation cools the roof in the summer. The thermal mass of the walls reduces the internal temperatures in the summer and increases the warmth in the winter. The differential between interior and exterior temperatures can reach up to 10°C.

The Arcò group built a building which is resilient for both the building and the community. The building was built within the given political constraints, within budget, using readily available recycled materials and simple technologies. The construction was quick and simple. The building can be maintained by the community within their technical know-how and budget. The building stabilizes the interior environment and will hopefully provide the best possible conditions to allow the students to receive a better education.