Traditional and modern housing architecture and their effect on the built environment in Lybia. A comparison of traditional and contemporary housing architecture as a method of assessing

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Academic Year: 2008-2011

The thesis faces the subjects of the appropriate technologies, mainly referred to the Libyan constructed territory in the Oasis of Ghadames (Sahara desert).
The study is carried out through processes of analysis and evaluation of the two more diffuse technologies in the local context: the traditional one, older and based on the use of rammed earth, and the contemporary one, created by structural system in reinforced concrete.
The methodology applied for the analysis, already adopted for the studies within the Abruzzo land's earth-buildings, had produced a critical review of the settlement characteristics, of the material, constructive and environmental aspects as well as of the decay processes within the building typologies.
In particular, the traditional housing in rammed earth in Ghadames have been catalogued according to the following information: at the settlement scale: distributive characters, original and present use destinations, alterations in the previous spatial configuration; at the building scale, so as to carry on the technological-system knowledge: technological and constructive description of the technical elements, kind of components, materials, shape, size and finishing, and of the conservation asset: survey of faults and comprehension of causes and evolution factors of the decay, structural conditions and building envelope thermal performance.
The developed analysis had confirmed that the Oasis of Ghadames represents an important sample of sustainable architecture, typical of the traditional built environment of the Islamic Arabic world. The case-studies, completed with local materials (adobe bricks, calcium, gypsum, palm timber) and techniques, are a clear expression of the socio-cultural values, mainly as far as the configuration, the sizing and the space distribution - due to the activities and thermal performance - are concerned, and provide an efficacy answer to the housing requirements and to the desert climatic conditions.
The impact of the constructive processes on the milieu and the environmental behaviour of the typical building systems have been assessed and compared with those connoting the more recent constructions with a reinforced concrete skeleton. The results show the economic and environmental sustainability values of both the systems: the first revealing very high scores and the second contemporary not satisfying ones.
Other effects on users' physical and psychological comfort have been surveyed by this study, concerning both the systems: the inhabitants of the ancient typology are comfortable, while the residents in the more modern settlements suffer of discomfort and satisfaction.
In conclusion the thesis proposes, for any eventual future development of the work done, the recovery and innovation of the settlement habits and of the traditional construction culture.

The survey of a typical three levels construction in Ghadames. (H. Efraites).

Feldkich Regional Hospital, designed by G.Grass; arch.E. Gutmorgeth; arch. A.Kuthan; arch M.Rauch (M.L. Miccoli)

The low environmental impact materials: the Rammed Earth.

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This thesis aims at verifying the chance of reintroducing, within the building current practice, the use of rammed earth constructions.
In the first stage, the research focused on the characteristics which allow the earth to be an highly eco-sustainable and bio-compatible material.
The introduction shows the value of the earth constructions over time, due to their stability and durability and some examples are illustrated.
The reasons are outlined for the abandonment of these construction techniques within the western countries, occurred definitely after the world war, when the new materials and processes based on the reinforced concrete and iron had substituted the slower earth and in general massive constructions.
The increase of the environmental question had then pushed the research towards appropriate technologies able to contain the building sector's high environmental impact.
The core of the thesis regards the number of experimental studies and projects carried on and applied all over the world, in order to create new models for a modern and sustainable use of the rammed earth, and to describe the characters, the performances and the peculiarity within the architectural language of these technological innovations, made up with the ancient material of the earth.
The Italian situation is also analyzed and read critically, where the legislative restrictions, mainly those for the structural system, reduce the already limited researches and design procedures.
The Getty Seismic Adobe Project's studies had opened the route to new evaluation criteria for the seismic resistance of massive structures, mainly in earth.
The earth constructions are suitable for very low-cost buildings, ideal for the development countries, as demonstrated by the experimentations by Nader Khalili, and by Martin Rauch. The latest's viewpoint, taken directly by the author during her PhD studies, demonstrates that the earth not only provides good indoor-performance systems, but also allows to create elegant and important homes.
All the studies carried out with this thesis, which enlarges the horizon of this ancient material's role, had also focused on the fact that these technologies have already joined in a perfect way the interpretation of the modern architecture language.