



Principles and case studies of bioclimatic semi-underground architecture

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The study examines the principles of bioclimatic underground architecture, its benefits and disadvantages, through some examples. The ideals and principals of this study will be manifested in the design of a semi-underground construction in southern Italy.

Underground architecture could, to a certain extent, contribute to architectonic diversity of cities, but also of some future suburban areas. It is special not only for the energy efficiency, but also for its unique aesthetics. Organized and planned construction of underground structures would solve the overpopulation problem in certain areas, and the surface area of agricultural land is increased, agricultural production as well and consequentially, the employment. The place and environment where we dwell, and work should be healthy. Underground architecture is in one part, small but not insignificant, attempting to reduce the load of the environment, use the nature without interfering with its laws.

Underground architecture is typified by four design approaches illustrated by the relationship of the building's mass to the surface: earth-covered spaces, submerged spaces, fully underground spaces and multi-level spaces. The study will provide a brief description of the four typologies and in the process will outline the advantages and disadvantages of each. The building forms are categorized based on varying criteria such as exposure to sunlight and views, as well as their impact on the surface. As such, the designer must choose the building form or a hybrid that satisfies the conditions of the project while also interpreting which form would be appropriate for the site.

This paper will provide a description of a study case about the reuse of an abandoned quarry that provides the design of a visitor centre. The project provides a "new green economy" through the development of a bio-agriculture, a bio-factory and an eco-sustainable research and combines ecology, horticulture, science, art, architecture and traditions of the site.

The solution was inspired by looking through nature, fractal geometry and the landscapes of the site. The Visitors Centre is the place of entertainment and education activities. The shape of this volume has been defined through a new re-interpretation of original slope of the site. The building appears like a rocky portion of the surrounding scenery as it looks like as if it is "growing" out of the ground. The fractal shape of the green roof is designed as a decomposition of plane surfaces with triangular shapes. The southern façade is characterized by a glazed surface. The eastern and western envelope are covered by a "green living roof".