



World Business Council for
Sustainable Development

Quarry Rehabilitation Case Study

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Quarry Rehabilitation: a CEMEX experience An experimental project on ecological rehabilitation in Mediterranean conditions

This case study is part of a series on quarry rehabilitation practices by WBCSD Cement Sustainability Initiative member companies. [Read about what other companies are doing.](#)

Location and situation

The CEMEX limestone quarry, La Martinenca, and its adjacent CEMEX cement plant are situated in the locality of Alcanar in the South of Catalonia. The quarry lies at the Southern foothills of the Montsia Mountain range in Spain along the coastline of the Mediterranean Sea. It is located within a prominent tourist area, in the proximity of many vacation resorts. The quarry has a total surface area of 140 ha with fifty percent of it exploited and twenty percent already rehabilitated. 11 million tonnes of material are extracted from this quarry per year.



Known biodiversity

The Montsia massif is designated as a Natura 2000 protected area. Being in an arid climate, the region's slopes are partially covered by predominantly Mediterranean forest type vegetation alliances such as Oleo-Ceratonion (Mediterranean Maquis shrubland), Quercion ilicis (Mediterranean Oak Forest), Rosmarino-Ericion (Mediterranean subshrubs) and Thero-Brachypodion (Dry Pastures). The area is home to a host of fauna including partridge, wild boar, fox, several species of birds and native goats.

Targets and aims

The primary aim of the rehabilitation work is to integrate the quarry with the natural landscape and restore the native vegetation. More specifically, the project has the following objectives:

- Imitate the geomorphology of the area by reproducing different types of landscape structures identified in the surroundings
- Initiate the natural vegetation succession through seeding of native herbaceous and shrub species that will prepare the field for more complex and mature vegetation: this process is more likely to succeed and to be sustainable than plantation of fully grown trees, especially in such a dry area. It also allows for better integration with the native vegetation.

As a pilot site of the EU funded EcoQuarry program, the rehabilitation project of La Martinenca also aims to contribute to the development and sharing of rehabilitation best practices for limestone quarries in a Mediterranean environment.

The rehabilitation process is progressive, which means that it is carried out whilst extraction activities are simultaneously continued in other sectors of the quarry.



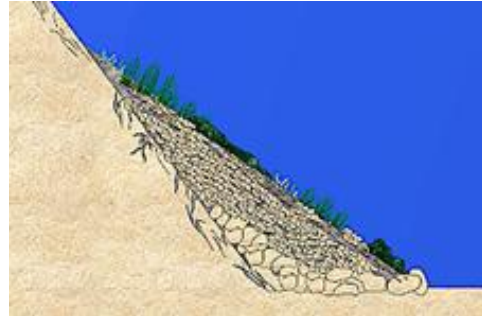
Restoration activities

The basis for the rehabilitation plan of La Martinenca rests on the following principles:

- Revegetation is to occur only with species native from the Montsia Massif and the existing plant communities are to be replicated
- Rehabilitation is to restore the first vegetation stages so as to trigger the natural vegetation succession process, thus ensuring long-term survival of the revegetation
- When possible and appropriate, rapid interventions such as the planting of shrubs and trees are to be employed to minimize soil erosion on slopes and to rapidly reduce visual impact in key spots
- Cooperation with local plant nurseries for plant production, collecting of wild seeds and control of germination, growth and plots

The process

- Firstly, a baseline analysis of the current situation including geomorphology, geology, hydrology, soils and botany was undertaken as an extensive study of the site and its surroundings, with the objective of characterizing the elements to be reproduced through the rehabilitation work.
- Secondly, the geomorphologic structures were reformed and soil restored. The inclination of the slopes was made to be 30-36 degrees for optimal restoration. Limestone blocks were used at lower levels to stabilize the formations. 300 000 Tonnes of soil was used, including 70% overburden materials and limestone from the quarry and 30% topsoil from external areas.
- Third, hydroseeding of the landforms took place to aid revegetation. In this process, seeds of herbaceous and shrubby plant species indigenous to the area are mixed with organic matter such as straw and cotton and mixed with fertilizers, natural stabilizing adhesive and vegetable fibers. The mixture is then sprayed over the areas to be restored through a system of seed dispersion.
- Lastly, the planting of native shrubs and trees such as Aleppo pine, oak, olive and strawberry tree was started in certain areas that need rapid interventions



Partners

The rehabilitation project started in 1999 with a research contract between CEMEX and the University of Barcelona's Geology, Hydrology and Pharmacy departments. The objective of this venture was to develop and implement the overall rehabilitation plan for La Martinenca. In 2004, it was then included as a pilot site in a wider project called EcoQuarry (Ecotechnology for Environmental Restoration of Limestone Quarries), funded by the EU Life program. The main objectives of this project are the following:

- To test at real scale new technologies for hard rock quarry rehabilitation in a Mediterranean environment, which is particularly difficult because of the dry climate conditions. These technologies should ensure rehabilitation projects of better quality and address particular environmental issues, such as the rational use of irrigation water.



- To establish limestone quarry restoration guidelines for Mediterranean conditions, including an environmental quality system

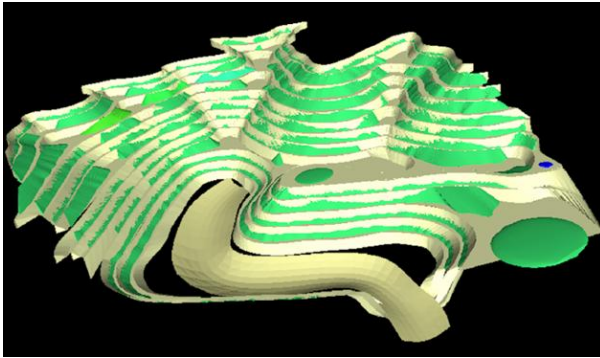
The project is implemented across 11 quarries in Spain and Portugal. It is coordinated by the University of Barcelona in collaboration with 5 other research centers. Additionally, there is continuous consultation with local authorities and information about the project is regularly shared with local communities and environmental groups.

Results

Twenty percent of the total surface area of the site has already been rehabilitated and, in May 2007, the site was awarded First position in the National Restoration Award of quarry affected areas in the category of Large Quarries. The EcoQuarry project is currently in its final stage of establishing a system of improved environmental quality for restoration works, using the information obtained in these pilot site projects.

Innovations/highlights

To better integrate the site with its natural landscape, technologically innovative computer simulation software tools were utilized for visual impact evaluation and a three dimensional modeling software was specially developed for simulation of the foreseen restored site.



The visual analysis included the calculation of visual impact values taking into account the following elements: views of the site from stations such as roads and tourist areas; main visual barriers (topography, vegetation and buildings); soils use; vegetation density and chromatic contrast between landscape structures. The 3D modeling system allows real time interactive views of the site from different perspectives.

Lessons learnt

When importing topsoil from the outside for rehabilitation works, it should be sourced from nearby areas with similar vegetation. Additionally, the seed mix of the soil should be controlled in order to avoid the introduction of non-native species.

Further information

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