



Candoglia Marble and the "Veneranda Fabbrica del Duomo di Milano": a resource for Global Heritage Stone Designation in the Italian Alps

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Alpine marbles have been widely used in the past for celebrated, both indoor and outdoor, applications. Among them, the Candoglia Marble, a worldwide known and appreciated georesource, and its "bastard brother" from the nearby Ornavasso area were and are exploited in the Verbano-Cusio-Ossola quarry basin of Northwestern Italian Alps. They crop out as lenses (up to 30 m in thickness) interlayered within high-grade paragneisses of the Ivrea Zone, a section of deep continental crust that experienced amphibolite- to granulite-facies metamorphism of Palaeozoic age. The Candoglia and Ornavasso Marbles are pinkish to greyish, coarse-grained (> 3 mm), calcitic marbles with frequent, cm-thick, dark-greenish silicate layers containing diopside and tremolite; minor minerals include quartz, epidote, sulphides, Ba-feldspar, barite and, occasionally, phlogopite.

First record of quarrying activities in the area arises to the Roman age (Ornavasso quarrying area). Both the Ornavasso and Candoglia Marbles were widely employed in local construction (San Nicola Church and Torre della Guardia at Ornavasso, Madonna di Campagna Church at Verbania, San Giovanni in Montorfano Church), but they became famous thanks to their application for the "Duomo di Milano" since the fourteenth century. At the beginning, the building stones employed for the construction of the Gothic style, Duomo di Milano were quarried in the Ornavasso area, but in a short time, the Candoglia quarry (property of the so-called "Veneranda Fabbrica del Duomo" that incessantly takes care of the Cathedral Church from 1387 A.D.) became the main quarry for the construction and maintenance of the Cathedral. The Candoglia quarry developed during the centuries, from open pit small quarries to a unique underground quarry, characterised by a very peculiar quarrying activities (subvertical bench characterized by strong lateral forces, which have to be contrasted and monitored).

The Candoglia Marble was preferred to Carrara marbles also because of the more direct transport way from quarries to the construction yard: the transport were acted on big barges, from River Toce, across the Maggiore Lake and its emissary, the Ticino River, and then along the Naviglio Grande, up to the Milano Cathedral yard.

The first saws driven by water wheels started to be employed in Candoglia to product slabs from stone blocks. Nowadays the working activities are both at Candoglia (block squaring activities and mason stone cutter laboratory) and in Milano (working plant). The peculiarity of the Candoglia Marble present exploitation is that all the quarried materials are used: as blocks (to produce the parts and sculptures for the Milano Cathedral maintenance), as armour stones (the irregular or not aesthetically suitable blocks) and as ornaments, furnishing, and jewels (the small pieces), so that everyone can potentially wear a "piece of history".

The Candoglia Marble, for its petrological characteristics, its history, including the evolution of quarrying techniques and working activities, and its use in the construction and maintenance of the Milano Cathedral, represents an "unicum" that would deserve designation as Global Heritage Stone Resource.