

# **Deterioration effects on bricks masonry in the Venice lagoon cultural heritage. Study of the main façade of the Santa Maria dei Servi Church (XIV century)**

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## **Abstract**

In November 2019, the city of Venice (Italy) was hit by high tides (more than 150cm), with the highest tide peaked at 187cm. According to government statistics (reports, graphs and data of flooding since the year 1860), it is the worst flooding in Venice since 1966, when the city was hit by tides of up to 194cm (76 inches). In addition, in the last century the Venetian air quality has been strongly affected by the industrial activity in the near city of Porto Marghera and by the proximity presence of the Marco Polo Airport, which enriched the atmosphere in the CO<sub>2</sub>, SO<sub>x</sub>, NO<sub>x</sub> airborne composites. The present study addresses these issues by proposing a study of 23 brick samples collected on the main façade of the Santa Maria dei Servi Church (XIV century), one of the historical buildings hit by the high tide's events in 2019. The façade is characterized by bricks of different color (yellow, pink and red) with an advanced decay conservation state due to the history of the monument and the environmental conditions. Color, mineralogy and texture of these samples were studied using standard methods such as, Spectrophotometry, Powder X-Ray Diffraction (PXRD), Polarized Optical Microscopy (POM) and Field Emission Scanning Electron Microscopy (FESEM-EDS). The presence of carbonates (calcite and dolomite) and new silicate phases (e.g. gehlenite and diopside) provided indications of the temperatures reached during firing and suggested the absence of a good standardization in the production process. While, X-ray diffraction and hyperspectral analysis (in the SWIR range) detected gypsum, halite and mirabilite as the main weathering products due to the salt decay process that affects monuments in Venice and in the overall lagoon environment. This work aims to increase the awareness in the decay process occurring on the historic Venetian urban texture to fix new planning tools and to achieve multiple goals oriented to a sustainable transformation of the city, leading it to more resilient solutions.