# The Conservation of the Baroque Heritage of Valletta

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The International Institute for Baroque Studies at the University of Malta promotes the baroque heritage, and one of its major roles is the conservation of baroque architecture. Age alone is seldom a sufficiently good reason for the retention of a building, and conservation for conservation's sake is an unsustainable argument. Quality and importance should be the primary factors, but even then individual buildings contribute little to the character of the city. This is determined more by the ordinary buildings that constitute the bulk of the built environment.

When conserving we are often led into the mistake of intervening on buildings isolated from their environment. We may carry out analysis on the fabric of that particular building, but completely ignore the impact of the surrounding environment on the building and vice versa.

Valletta is a World Heritage site. It lies within a densely populated urban conglomeration, characterised by industrial areas and heavy traffic. Valletta and Floriana are established office centres generating considerable vehicular traffic within the fortification network. Activities focused around the Grand Harbour should also not be undervalued. The central power station at Marsa, the Malta Drydocks and Shipbuilding, and a number of smaller industries within the Marsa and Corradino industrial areas, discharge harmful substances into the environment. Cruise liners and cargo ships, although on a much smaller scale, are also an important source of pollution. As a peninsula, Valletta is constantly subjected to a salt-laden environment, while its siting on a promontory makes it more exposed to the prevailing winds.

Valletta is also inflicted with other problems. A daily influx of people concentrated within a small area of the capital city creates extensive pressures on the potential use of buildings within that quarter. They also imply a heavy demand on the infrastructure of the city, necessitating a constant upgrading of the systems.

These are in turn associated with civil engineering works, which together with other construction works, mostly related to the refurbishment of commercial outlets and the increasing trend of excavating larger and deeper basements, contribute to further pollution generation. In this case mostly in the form of vibrations, sound, and dust. Other activities, such as the traditional *karrozzin*, can also contribute to the generation of undesirable vibrations. Similarly to other major cities, Valletta is also a pigeon-breeding place.

These factors are undoubtedly not new. To date, however, little scientific information on these factors exists. It is high time that all entities concerned with the conservation of Valletta put their heads together and seriously embark on a scientific monitoring project intended to quantitively assess these agents. The quality of air and rainwater, temperature cycles and humidity, need to be recorded and assessed. Similarly, well-

*Aerial photograph of Valletta*

coordinated surveys indicating vehicle flow into the city and emissions need to be carried out periodically.

There is also an urgent need for stocktaking of the buildings of Valletta. The fact that a significant number of the building stock is vacant or underused is acknowledged, however only sporadic information exists on this phenomenon. Similarly, no information on the general state and condition of the buildings in Valletta is available. Research on the ownership and history of particular buildings should also be recommended.

Buildings are constantly evolving, and once an intervention has taken place, what was altered or removed is lost forever. The recording and documentation of buildings in Valletta should thus be an ongoing activity. An inventory including a description of a building, the important dates in its history, and its location, need to be prepared. This would prove invaluable in the event of a natural disaster or other calamities. Satellite photographs, aerial photographs, as well as aerial and terrestrial photogrammetry are invaluable aids to forming an inventory.

The recording methods which could be effectively used are various, and their choice depends on the final objectives of the records. Simple methods using hand recording, rectified photography or video, to more elaborate systems including the use of electronic theodolites or stereo photogrammetry, could be used. The limiting factor is often dependent on the human and financial resources available, as well as on the objectives and utilisation of the records.

Although still in the initial stages, the Restoration Unit within the Works Division at the Ministry for the Environment has already begun the documentation of buildings and the gathering of information in this regard. Research in local and foreign libraries is being conducted, and site investigations to assess the original methods of construction and the present state of the buildings has been initiated. These entail the use of sophisticated and expensive equipment, such as endoscopes and thermal cameras, which the Department has recently purchased. These systems have already been used for the church of Santa Caterina d'Italia in Valletta, and for the Ospizio in Floriana.

The Restoration Unit has also embarked on a laborious process of accurately documenting some buildings in Valletta. Various methods as deemed suitable for each particular case are being adopted in this exercise, and include the use of rectified photographs, digitally rectified photographs, surveying techniques, and photogrammetry. A series of aerial photographs of Valletta, Mdina, Cottonera and the Citadel in Gozo for the restitution of a detailed set of 1:500 scale survey sheets have also been commissioned.

The data generated will inevitably be phenomenal, and all efforts invested in this gathering of information would be futile if no efficient way of storing, retrieving, and analysing this information is adopted. It is also important that the information collected is made easily available. A Geographical Information System is the logical solution to this necessity. A GIS is a powerful tool developed for analysing spatial data. A GIS can be defined as "a powerful set of tools for storing, and retrieving at will, transforming, and displaying spatial data from the real world for a particular set of purposes" (Burrough, 1986: 6). It can also be defined as "an automated system for the capture, storage, retrieval, analysis, and display of spatial data" (Clarke, 1995: 13).

The importance of compatibility must be stressed. Databases should be designed to conform to international standards, and all data should be stored in such as manner so as to permit maximum flexibility in its future use. The Restoration Unit within the Works Division is in the process of setting up a comprehensive database of Valletta, where all conservation related information will be filed. It is also earmarked that this database will be made accessible through the Internet.

We can only be confident to intervene on a building after having assimilated this information, and closely understood the agents influencing its deterioration.

The most common causes of building deterioration can be classified in three categories: physical, chemical, and biological. Physical damage is, in many cases, brought about by lack of sensitivity to the building fabric. Metal nails and pins are indiscriminately fixed into the building fabric. These rust and expand, creating stress within the stone. Being weak in tension, this will inevitably lead the stone to break.

Services are chased into the building fabric, in various cases even damaging mouldings. Vehicular traffic, particularly in narrow streets, can also cause irreversible damage to stonework. Settlement of building foundations will inevitably lead to a redistribution of loads, creating point loads, with the consequence that the masonry blocks will crack. During the past years, the practice of hacking extensive areas of facades has gained in popularity. Similar interventions are irreversible and negatively affect the aesthetic qualities of the building. They even contribute to further deterioration.

When analysing typical baroque buildings, the presence of chloride and sulphate salts normally predominates. Nitrates are usually found in much lesser quantities. Chlorides, as derived from sodium chloride, are more abundant in coastal regions, since they are mainly of maritime origin. They penetrate the structure either from the ground, or through marine aerosols transported by the wind. The most frequent sulphate salts occurring within normally deteriorated structures are calcium sulphate and sodium sulphate, found in different forms of hydration.

These salts usually originate from atmospheric pollution or seawater, which besides sodium chloride salts contains traces of magnesium sulphate. Cement, used sparingly in interventions, can also be considered an important source of sulphates. As a result of impurities introduction during the production of cement, several soluble or partially soluble salts, such as calcium hydroxide, sodium hydroxide, sodium sulphate, and calcium sulphate, are formed. In the presence of water, these salts are free to migrate into the pore structure of the limestone fabric, onto which the cement-based plaster has been applied.

In practice, water within the building fabric can owe its origins to a combination of capillary action from the ground, rainwater percolation, condensation, and seawater spray carried in the air as aerosols. Capillary rise increases with time, as soluble salts are carried by water into the masonry and become concentrated. These concentrated salts cause a greater affinity for water. Equilibrium is never reached, and the capillary rise of water increases with the structure's age. Condensation occurs when the air is damp, and the masonry surface is colder than the dew point of the air.

Condensation water has higher capabilities of dissolving suspended dirt and gaseous pollutants in the atmosphere, and can thus be more acidic than rain water. Liquid solutions containing free sulphuric acid then form on masonry surfaces in polluted atmospheres, and particles of carbon, iron oxide, calcium sulphate, and other substances are deposited. Stone deterioration is generally the result of large internal stresses, which build up within the pore structure of the stone. These usually take place within a small distance from the surface, and because stone is very weak in tension they cause the failure of the same material. The mechanisms by which similar internal stresses originate vary, and range from extreme climatic conditions to smaller localised reactions occurring within the pore structure of the stone. When analysing buildings in Valletta, the deterioration of the limestone fabric is mainly due to the behaviour of various salts and their interaction with water.

It has long been debated whether biological growth instigates rock deterioration and soil formation. Living organisms such as lichens, algae, mosses, fungi and bacteria implanted on masonry surfaces produce visible colour effects.

Considering the relatively high levels of atmospheric pollution in Valletta, similar growths are unlikely. Yet plants flourishing from open joints, particularly around defective pipes, are a common phenomenon. This is always associated with the presence of water, and the cause of similar growths should be remedied without unnecessary delays. Although seemingly innocuous, plant roots, particularly those of a hardwood nature, can penetrate deep into the building fabric to find nutrients. In the process, the roots increase in thickness, displacing masonry blocks and encouraging further water penetration.

Deterioration processes in a building can be various, and the determination of their causes is complex. It is thus necessary that prior to any intervention, analysis on the building fabric is carried out. This may include the use of sophisticated equipment such as X-ray diffraction, and should primarily be aimed at establishing the porosity and chemical composition of the construction material, as well as a thorough analysis of the products of deterioration. Active vegetation and microorganisms should also be identified. In this respect, temperature and humidity surveys of the building, including daily and seasonal cycles, would be useful.

It is the current trend that a conservation intervention terminates with the dismantling of the scaffolding. This should not be the case. A restored building should be monitored, and inspections carried out periodically to assess the effectiveness of the interventions. It is essential that during this process all data gathered is stored in the database for future use. It is only thus that we can learn from our experiences and build on our past for the protection of our architectural heritage.

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