SITES, FEATURES AND ENVIRONMENT OF ANCIENT STRUCTURES: A METHODOLOGICAL APPROACH IN CONSERVATION

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Keywords: *Failure, Natural risk, Monument conservation*

ABSTRACT

In conservation, the guarantees of protection of ancient monuments derive by the analyses of the structural characteristics and of the building material properties as well as by the physical and environmental site conditions. The specialised literature has supplied a remarkable knowledge about this argument but often it does not sufficiently link the historic construction, the architectural characteristics and the natural risks. The site "adjustment" of a structure is an important factor which determines the durability of the structure itself. Weathering and natural events act in the short and long time, pre-disposing the failures and bringing them to the definitive collapse; in this context the investigation of the damage processes needs the knowledge of a wide range of environmental and geological factors. This concept must be kept with care above all for the ancient monuments which need rehabilitation; the intrinsic causes (i.e. planning defects, building yard) cannot be separately considered both by the extrinsic causes (i.e. occurrence of aggression from the extern) of short and long term action and by the environmental context.

The evident relation among failures, morphological characteristics of the architectonic structures, building materials employed and environmental conditions of the sites can be observed through the Mediterranean fortified systems, which are distributed in different territories and cover a wide chronological period.

The overview of the ancient structures failures represents an interesting element to detect the factors that limit the durability of monument.

INTRODUCTION

The fortified systems on the Mediterranean basin have been the subject of several scientific research in the field of monuments preservation [1]. These architectonical structures represent a building typologies perpetuated in every historical period, complemented by the variability of the operation planned, the large time span that they cover, the different nature of the building materials used, the different geological environments and meteo-climatic conditions of the sites in which they were built. Today many fortifications are characterized by failures, or rather, by the alterations of the static equilibrium, related to the stone decay of the construction materials employed or to the effect of weathering as long as the unfavourable conditions of the sites favour the ruin in a short time.

In the different territories, according to needs linked at different times to social, political, religious and military organizations, towns fortified with strong walls and towers were built along coastlines and frontiers, and defensive installations, including castles - the maximum expression of the planning of defensive systems - were built. The techniques for the realization of these defences are expressions of different ages as demonstrated by the working of the materials employed, that followed the course of technological evolution, passing from the simple fitting together of the blocks of dry-stone walls to the perfect execution of walls and other features, with shaped and finely worked blocks.

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The oldest defensive systems have been found in the middle-east; archaeological excavations have demonstrated that in the 4th millennium BC all cities were defended by surrounding walls, in stone and brick, often surrounded by ditches or with elevations of earth. With the development of the Cretan-Mycenaean civilization, walls with cyclopean blocks were employed for the fortification of the palatial settlements of Knossos and Festos and then of Micene and Tirinto (Fig. 1).
In the age of Pericles (1150 BC) more complex fortified systems in stone and brick were developed. The construction techniques of the classical age, during which blocks of large and medium size were employed (from 0,25 to over 1 metre in height), continued in the Hellenistic age (from the 6th century BC) and were carried on by the Greeks in the colonies of southern Italy, above all in Sicily (Syracuse and Agrigento).
In the western Mediterranean remains of Bronze and Iron Age villages fortified with walls with cyclopean blocks have been individuated in Italy, France and Spain. Among the oldest defense and refuge systems it is possible to find *talayots* of Balearic Isles and *nuraghe* of Sardinia, dating back up to the 2nd millennium BC. The talayots, formed by a great tower surrounded by walls, anticipate in a remarkable way the setting of the medieval castle. In Sardinia, the Phoenicians and their successors, the Carthaginians, who colonized the island in the 6th and 7th century BC, spread the defensive boundary walls on both coast and inland (eg Tarros and Syra) in support of Punic domination of the sea.

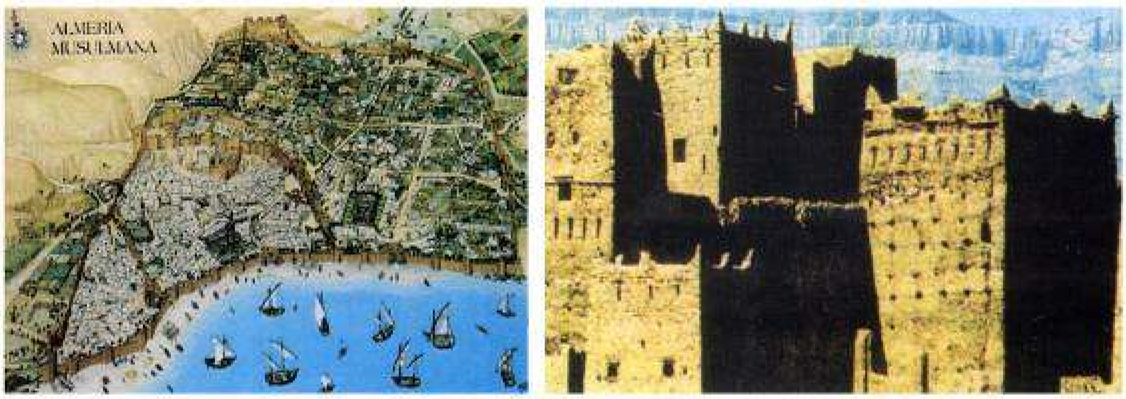

Micene


Barumini

Figure 1: Ancient towns and religious sites surrounded by defensive systems: the use of blocks of great size (cyclopean blocks) began in the second millennium BC (Micene); the fortifications on the western Mediterranean coasts were formed by a system of concentric towers grouped around a central tower (*nuraghe*, Barumini, Sardinia)

The Romans, who succeeded in 283 BC the Carthaginians, superimposed new defensive systems on previous one. The *castra* were built around the Mediterranean basin subject to Rome (Gaul, Iberian peninsula, Cyrenaica, Greece, Egypt, Middle East). The roman defensive installations were formed by a rectangular fortification line with walls of great thickness, in stone and brick, flanked by corners towers which sometimes covered the entire perimeter.
In medieval times, a considerable development of fortified works interested France, Italy and Spain, which was the scene of the long conflict between Islam and Christianity. Many of these fortifications are characterized by geometric regularity, linearity and simplicity of form and do not have very strong walls or towers, owing to the inefficient war machines used on that time: artillery would become dangerous only from the start of the 15th century.
The Maghreb fortification systems were developed on the Mediterranean shores of Africa (Fig.2). Both ancient and newly founded centres were protected by walls and, built in compressed earth (*pisè*), have been destroyed in the course of time or substituted with stone material. The *ribat*,

fortress-monastery, are the oldest and most traditional types of Islamic fortifications on the coast of Africa; examples of these forts, which also date to the 9th century, are found in the territory of Tunisia (Fig. 2).
At the beginning of the 16th century a resumption of the construction of defensive installations coincided with the contrast between the Ottoman empire and the states of Christian Europe. After the fall of Constantinople (1453) the Turks sought to penetrate the western Mediterranean while, to contrast that expansion, Spain starts fortifying its eastern and southern towns and coasts, including Gibraltar, North Africa, the Balearics and the south of Italy. Until the 18th century the fortification process was marked by alternating phases between the Spanish and Ottoman empires: imposing fortifications appeared in Sicily and Malta and along the France coast, from Marseilles to Toulouse and to Saint Tropez. There is practically no maritime city in the Mediterranean without walls, more like the structures of a true fortress than the usual surrounding walls. Venice, as well as organizing its defences in its lagoon, built fortresses in the Adriatic and in the eastern Mediterranean in all the territories occupied by the Venetian Republic. Walls with bastions and moats, strengthened by large volumes of land in the most exposed zones, were carefully planned.
Towards the end of the 18th century further progress of military technology was accompanied by the abandonment of the passive defence of cities. The fortifications and the coastal and frontier installations, including those of the last century, with the evolution of arms, have seen the employment of a new building material: the reinforced concrete. Today the old defensive system of the Mediterranean remains often abandoned to neglect and decay and, in many cases, disappeared everywhere: the remains were buried by the same city which they had protected for many centuries.



Almeria, Spain　　Ksour (fortified village), Morocco

Figure 2: In the 16th century between Alexandria and Tangiers the Islam fortification system can be found at intervals of about 40 km, while, in Europe the revival of fortified systems began: great rampart were projected to reinforce the earlier Roman fortifications (Almeria, Spain); in Maghreb the defensive installations were built with compressed earth (*pisè* - Ribat Monastir, Tunisia) or mud mixed with straw and stone (Ksour, Morocco).

RESULTS & DISCUSSION

Sites

Planning the defense of cities, frontiers, coastlines and ports required, on one hand, reading the territory to adapt the defense system to the ground and, on the other, establishing the observation point and the weapons placement (Fig.3a).
In order to achieve a unique architectural design related to the physiographical aspects of the region, every defense structure was therefore designed and built following a project in line with

the features of the site. The passive element of the structure (walls, towers, ramparts) must necessarily relate to the morphology of the sites, that influenced the planning of every important defensive work. The need to adapt the structure to the site, using the forms of natural obstacles, result in regular or irregular geometric layout for the design. The first type of solution is generally found in plains and large islands, the second is fairly typical of small islands and coastal belt.
Key of the defense systems are the fortified walls of which are conserved very different types, owing to the modification suffered in time to adapt the walls to the evolution of new offensive weapons. The fortification of Gibraltar is an interesting example in this regard: the defensive system is the result of successive constructions summarizing four stages, from the Moorish of the 12th century to the English of the 18th century (Fig.3b).

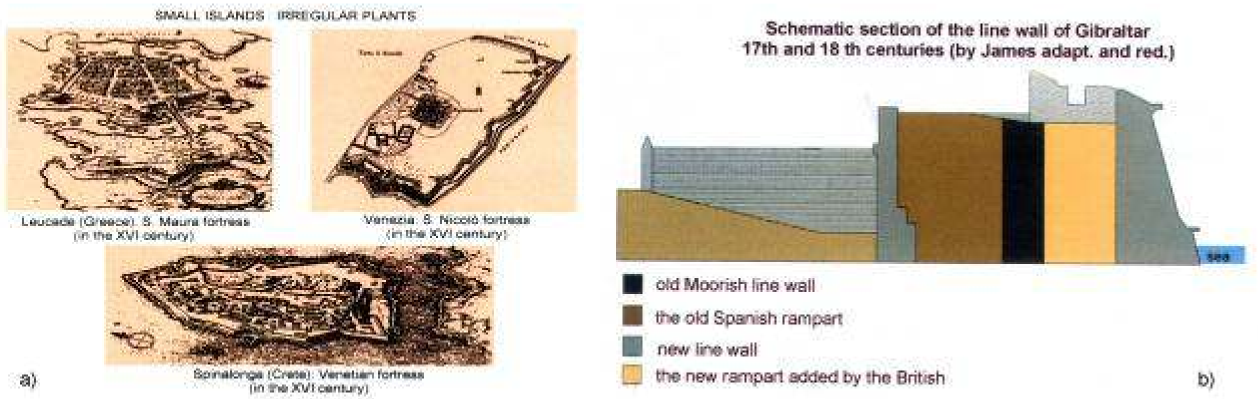


Figure 3: Fortress designed on the basis of the morphological characteristics of the site (a); passive elements of the fortifications: the rock of Gibraltar (b)

In every case the planning decisions made were based on whether the site was an offshore island, a small promontory, or an anchorage, on whether it lay on a stretch of low-lying straight coast-line, or one interrupted by heights, or whether the coast itself was high and steep, with cliffs, or was on an alluvial plain, or if the site was situated on a crest or on a spur formed by two confluent valleys (Fig. 4).

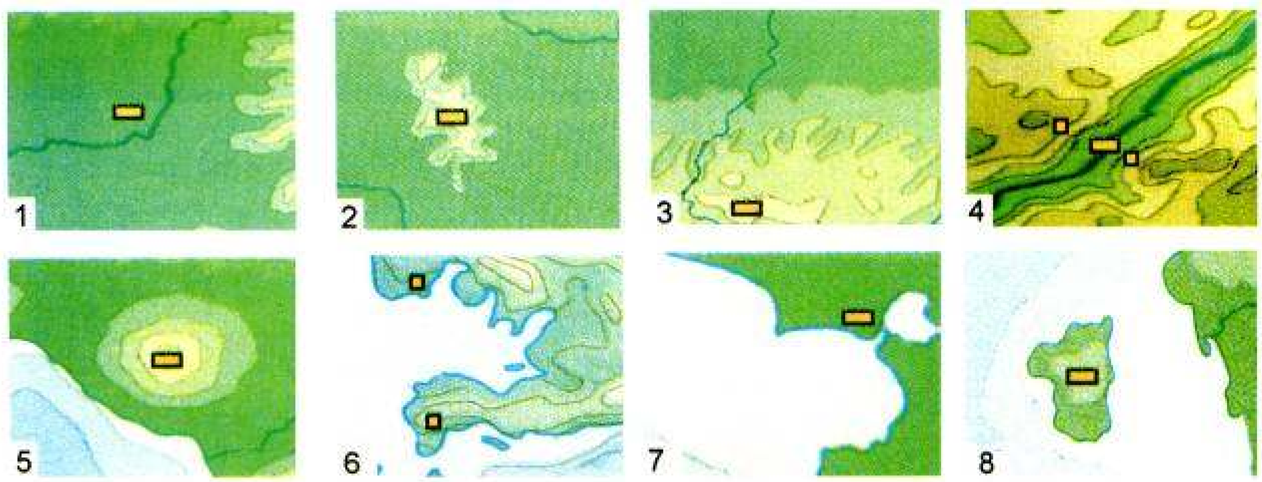


Figure 4: Morphology of the sites: the typology of the fortresses built in plains (1-close to natural obstacles; 2-isolated hill; 3-crests above alluvial plains; 4-barrier to an alluvial plain) and coastal reliefs (5-isolated peak; 6-small promontories; 7-entrance to a port; 8-island) influences both the design of the constitutive elements of the defensive systems and the occurrence of intrinsic and extrinsic causes of decay

Building materials

The stone materials employed in the construction of the defensive systems are different in origin and composition. The varieties observed depends almost always on the locations in which the defensive structure is situated: a close relationship exists between the material used and the geology of the site. In fact, the use of the local stone resources allow to build the fortification in short time and to have a large amount of stone material at disposal, even at the expense of quality: outcrops of soft rocks and rock masses characterized by fracture and stratification joints were considered valid for extraction if found in large quantities not distant from the site selected. On the contrary, the material, especially the decorative stone, used for the most important public buildings such as villas, palaces and temples, came generally from far away.

The defensive construction can be considered as a product of local stone resources. Vitruvius in Book I writes "the material with which the construction is realized cannot be the subject of prescription, for the simple reason that we cannot have in all locations the resources we wish for; but, for example, where square blocks are available, or flint, or cut stone or baked or unbaked bricks, these will be the materials to realize. In fact, it is not possible that all regions or localities with their own characteristics can have equally the same valuable resources to employ, so that in procuring them a wall may be realized full of defects for eternity...". This is the explanation for the fact that many defensive systems have not survived for a long time.

For the construction of the walls, use of stone and bricks predominated from ancient times until the 19th century, when cement began to be used. Large blocks were preferred, but relatively small elements, sometimes unworked or perfectly squared were also employed. When a rapid method of construction was required, the fortification were always carried out with blocks of irregular sizes and form, at the expense of stability. In more recent times, when the economy could satisfy the technical requirements, stones with better characteristics began to be utilized for the base, the edges and the slits. The best varieties substituted those normally employed for the walling as revealed, for example, by the employment together of compact limestone and soft limestone, of tough and soft sandstone, of schists and sandstone or of basalt and limestone (Fig.5).

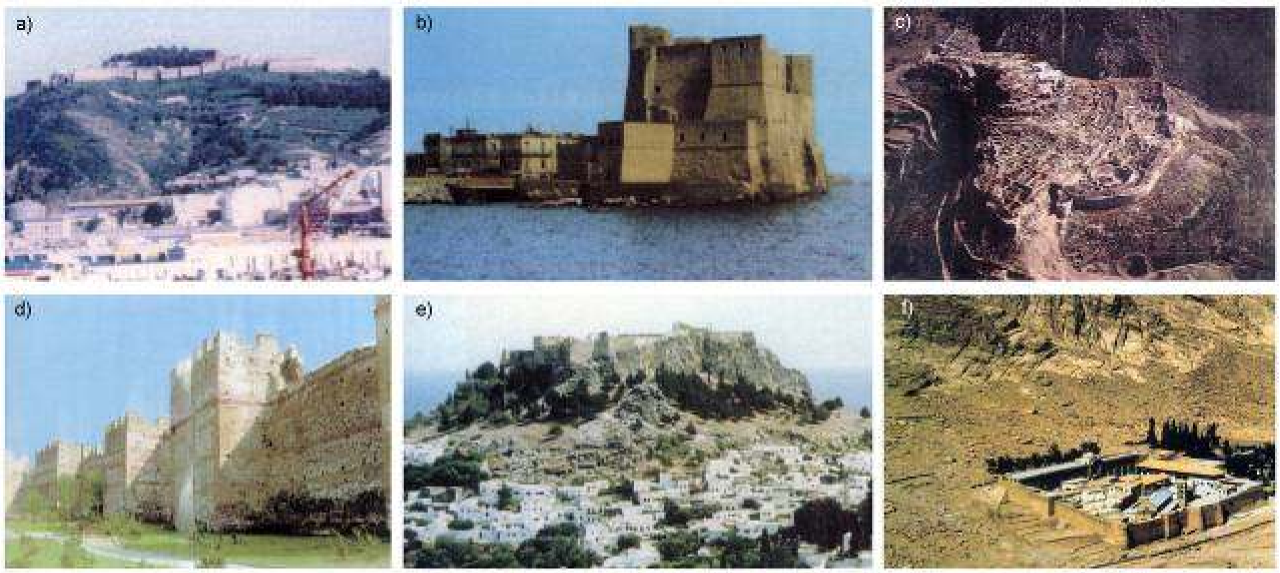


Figure 5: Relationship between geology of the sites and the employed building materials. Where it was necessary a great amount of stone materials, the outcrops have determined the local choice of the material: a) Ceuta, Fort Hacho - migmatites, schists and sandstone; b) Naples, Castel dell'Ovo – tuffs; c) Micene – conglomerates; d) Thessaloniki – crystalline schists; e) Acropolis of Lyndos – calcarenites; f) Monastry of Santa Caterina, Sinai – tectonized granite

In territories where rock outcrops lacked, bricks (air-dried or baked or of compressed earth) were used. Walls of earth brick (*adobe, tapia, pisè*), made of mud pressed in wooden moulds and mixed with straw are known in North Africa, Anatolia, Egypt and Crete, and also in Spain, at Carmona and at the Alhambra in Granada, where also arches and vaults were realized with this technique.
For fortresses located on alluvial plains or on coastline and piedmont belts, or on desert sites, it was advisable to exploit supplies of rounded pebbles from rivers or from beaches, or unformed clasts collected on the surface.
With regard to the towers which completed the defence of the territories entrusted to high coastlines and to fortified ports and cities, their structure would achieve the best installation with the minimum resources. The availability of materials is related to that provided by the locality of the towers. In the south coast of Spain, for example, going from Almeria to Algeciras, on the Strait of Gibraltar, it is possible to find a succession of towers made of sandstone, shale and Dolomites according to the different nature of the outcrops existing along the stretch of coastline on which they arise. Along the Adriatic coast of Apulia (Italy), instead, the Serpe tower (Otranto) lies on an area that marks the contact between different geological formations, providing the different qualities of stone (cretaceous limestones, hard Miocene limestone, Miocene calcarenite) recognized in the variety of blocks used [1].
Guard towers made of earth, which combined the advantages of low cost and effective defence, have also existed on the coasts of the western Mediterranean.
Another technique, with an ancient tradition in Hispanic-Muslim architecture, which was much used from the 10th century onwards, but which was also employed in Egypt and in the Islamic world, involved a casting based on earth, lime and gravel to obtain solid rectangular towers. The Nazare Tower of Romilla, near Granada, of truncated-pyramid form represents an interesting example of this construction technique.
Moreover, the stone blocks and bricks observed usually are laid in different ways, due to the different craftsmen who worked on the structure at different stages, as the presence or absence of pointing and the presence or absence of wedges, also in brick. On the other hand, the different dimensions of the materials utilized cannot always be related to the chronology of construction. However, the construction techniques have remained essentially unchanged from ancient times and have been perpetuated and utilized also for the normal walls of buildings.

Environmental condition

The physical and chemical weathering suffered by the building materials depends on the meteo-climatic conditions of the Mediterranean Basin and on local conditions of natural and anthropogenic pollution. The Mediterranean occupies an area of transition between the continental semi-arid climatic zone, situated in the lower latitudes, and the humid temperate maritime climate of the higher latitudes. Along the coastal belt the precipitations, as a result of the incidence of morphological factors (altitude and distance from the coast) and microclimatic factors (atmospheric pressure, temperature, humidity, wind speed and distance), have very different characteristics from region to region (Fig.6a).
The external aggressiveness on the materials is enhanced by the natural pollutants and the marine aerosol present in the atmosphere. The sodium and chloride ions, the principle component of the marine aerosol, show high concentrations both in the western (8 meq/m^2) and eastern areas of the Mediterranean and contribute actively to the intensification of stone decay. Moreover, the aerosol effects, whose production is evaluated about 10^9-10^{10} tonn/year, can be found also inland, according to the concentration of the depositions in wet and dry phase [2-3].
In particular, the data collected with regard to the depositions in the wet phase reveal a seasonal variation of the chemical composition: a greater concentration of the ions of marine origin (Cl^-, Na^+) is registered during the winter, while those of continental (Ca^{++}) and anthropogenic origin

(NO_3^-) are dominant in autumn and, in a more marked way, in spring and summer. Instead, with regard to depositions in the dry phase, sulphate (SO_4^{--}) and nitrate (NO_3^-) of marine and anthropogenic origin are prevalent in spring and summer, while chloride (Cl^-) concentration is greater in autumn and winter (Fig.6b).
The stone materials are subjected in time to the decay of their mechanical characteristics, due to the combined action of the meteo-climatic conditions and the mechanism of the natural weathering processes typical of the sites, enhanced by the mineralogical-petrographic properties and the textural characteristics of stones. As a matter of fact, the lithology, the textural and structural properties of building materials and the cutting and orientation of the blocks in the masonries influence the weathering processes. Common forms of weathering intensified by marine aerosol are detachments, granular disaggregation, fissuring, scaling, pulverization and sub-efflorescences.
Chlorides and sulphates can migrate from wall surfaces inside the masonry, within the internal micro-fractures or through the pores, where, crystallizing, favour the development of detachments or the decohesion (granular disaggregation) of the stone. The differential decay, related to the composition of grains and cement, the organic (fossils) and the inorganic textures (laminations, graded bedding, stylolites, sheet and dessication cracks, etc) of stones, is increased by the presence of salts.
Digital image analysis and evaluation of the thickness of material affected by decay process may facilitate the assessment of the walls conservation, of the rate of weathering and its evolution. The analytical technique ICAW (Integrated Computerized Analysis for Weathering) [4] has been developed to support the selection of the restoration intervention and to plan control activities and monitoring.

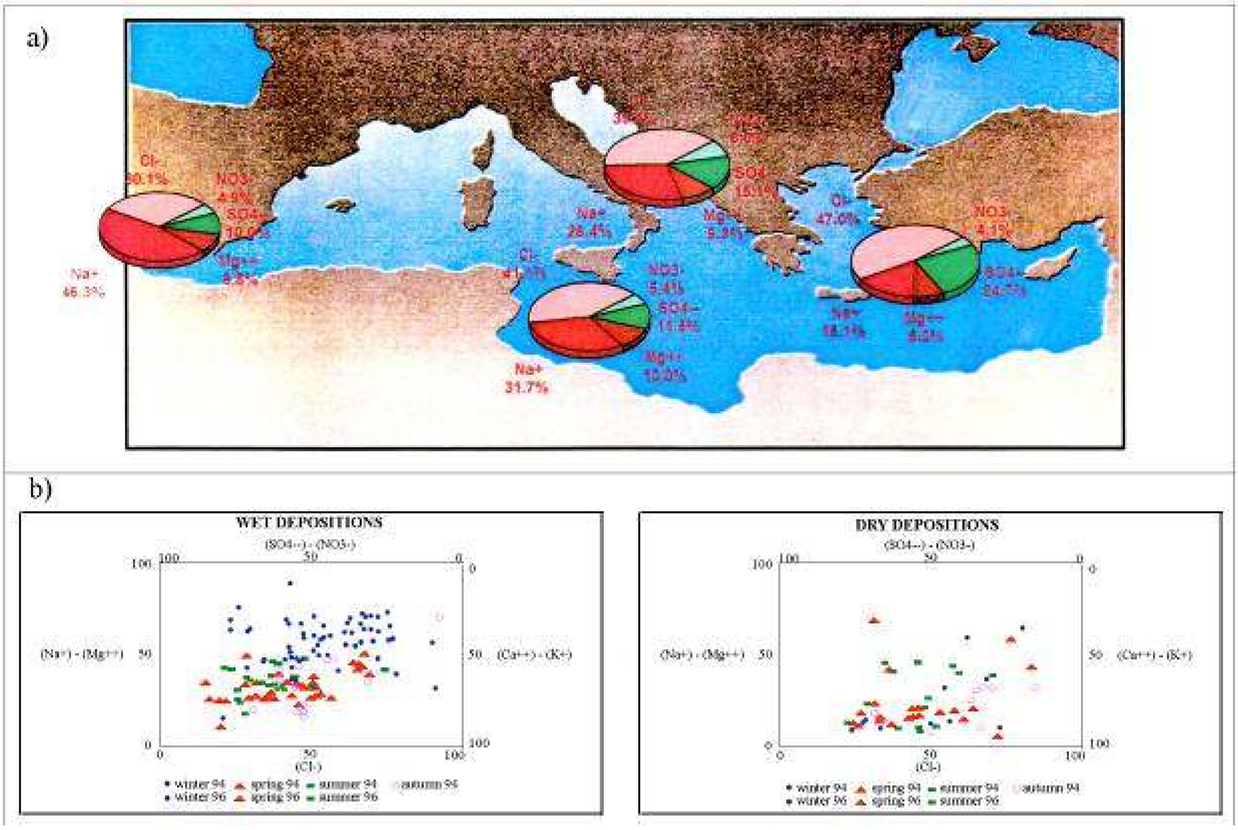


Figure 6: (a) Ion concentration of marine, continental and antrophogenic origin in wet and dry deposition recorded at the monitoring stations of Cadis (Spain), Bari (Italy), Siggiewi (Malta) and Eleusis (Greece); b) in the wet deposition the ions of marine origine (Cl^-, Na^+) are dominant in the winter period, while in the dry phase Cl^- is deposited in autumn - winter

Failures

The defensive systems have been subjected to attacks and have suffered sacking, destruction, violation and modifications; however, those which have resisted the impact of arms and man have, like every other construction, encountered various types of damage deriving from the intrinsic weakness of the structure or linked to the geological characteristics of the sites and to the weathering processes (external causes). In this way, it is possible to survey the major collapses and the cause-effect relationship affecting these structures in the different environments, essential to plan the protection of cultural property.

The static failures of fortified systems are usually revealed by the fissuring which is found on the walls. Vertical cracks normally indicate a loss of cohesion of the wall; cracks provoked by failures due to foundation settlements (relative settlements limited to parts of the foundation) appear as movements of portions of the upper parts of the wall; cracks, which are not greatly inclined and are without relative movement of the parts, are determined by horizontal thrusts. The first type of damage is due to mortar decay and to sea salt transport and crystallization by rising damp process, as is also demonstrated by the numerous cases of fortifications built with soft and porous stone (neogenic and quaternary calcarenites), both when the fortifications are located facing the sea or near the coastal belt or when they are built on terrains with surface water table.

Collapses characterized by the loss only of the external facing walls are also common in non-homogeneous ancient walls, as the dry stone walls (Otranto). When the mortar decay is joined to the blocks weathering, the marine aerosol shows a selective degradation, more aggressive for soft (Miocene calcarenite) than for strong (Cretaceous limestone) material. In many cases the nucleus of the walls, filled with pebbles, forms an agglomerate of stones irregularly arranged with occasional horizontal pointing and very limited connections. These structures are unstable even if the rising damp is not attracted by the walling owing to the internal spaces; in fact various factors contribute to the failures.

The collapse of line walls may also occur on terraced slopes where streams and infiltration water are present. The Venetian fortress built on the island of Spinalonga (Crete) in the 16th century provides interesting documentation on this regard: a sub-surface flow of water determine the erosion of the cliff. The walls collapse and topples and slide phenomena occur where loose material covers the fissured limestone (Fig.7). Other deformations on the walls, as thrust, may be linked to pressure created by soils or by atmospheric movements (wind) when the walls can offer only a scarce resistance. The first sign of this type of stress is bulging or the rotation of the stressed parts. The formation of cracks accompanies the rotation of the wall, as already occurred in the archaeological site of Micene (Greece).

Other forms of failures which affect the fortified sites often originate from phenomena of collapse into voids. These forms of failure are found in karstic areas and in areas subject to underground extractive action. Cases can also be found which represent an extremely interesting example of natural and anthropogenic habitat. The Massafra Castle, built at the edge of a *gravina* - an eroded gorge in the Apulia region, Italy, linked to the alignment of significant tectonic discontinuities (faults) or zones of intense fracturing affected by natural and artificial cavities - has been subjected to restoration intervention (Fig.7). This zone has already been affected, on the SE wall, by a major collapse which has involved part of the square and access road to the Castle. This event was caused by the collapse (collapse into voids) of the vault and/or pillars of the cavity belonging to the two upper levels as well as by the infiltration of water.

Directly from the sea there is also the recurring danger for the fortifications near the coastline of failures deriving from the destructive action of the sea. The erosion by itself cannot explain the extent of the retreat of some coastlines for which it is necessary to invoke phenomena of marine ingression and tectonic movements that provoke the slow advance of the sea on land (tectonic subsidence). In this context the rock cliffs undermined at the base by marine erosion become

unstable because they are subject to slope movements: a) falls of blocks isolated by different systems of joints detached from steep walls with formation of detrital accumulations at the foot of the cliffs (rock falls); b) falls (rock topples) along parietal macro-joints, typical of overhanging slopes; c) sliding of an entire series of layers (rock slides) due to the lack of morphological contrast at the foot of the eroded slope along the pre-existing discontinuity surfaces (fractures or stratification joints), unfavourably inclined along the slope (Fig.7).
In turn the detrital formations and pseudo-coherent sediments (clays) reveal erosion forms due to the undermining at the base of the slopes by marine erosion with slides of various types dominated by slumps and earth-flows.

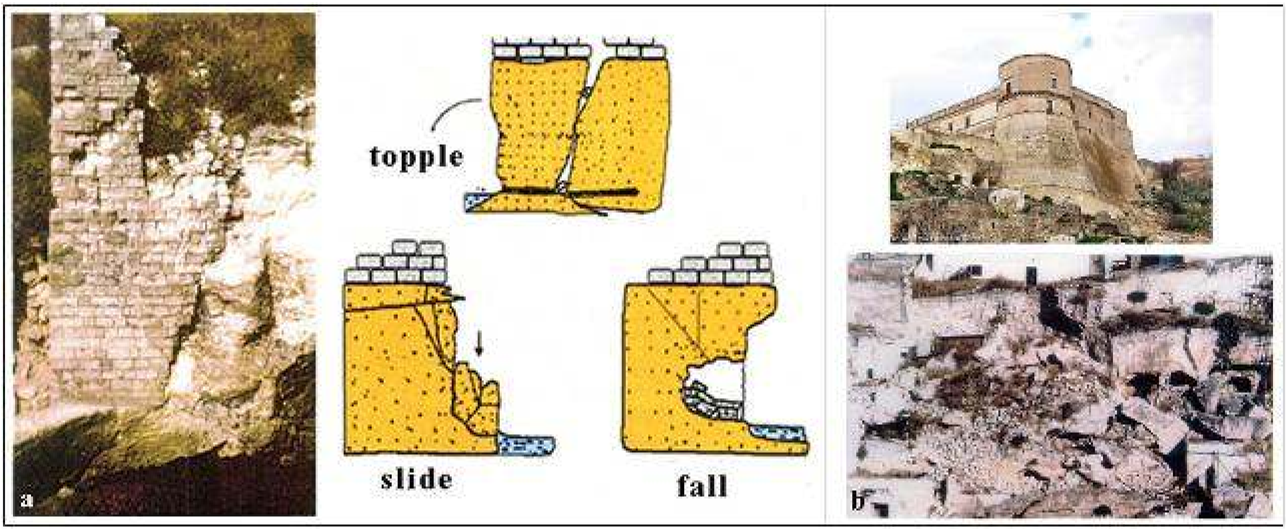


Figure 7: Mass movements: a) an example of the morphogenetic action of the sea on cliff which provokes detachments as falls, rock topples and slides of blocks involving archeological remains of ancient walls (IVth century B.C.) and bastions of the fortified walls of the medieval town (XIV century A.D.) in Roca, Italy; b) instability phenomena provoked by the collapse into voids (medieval Castle of Massafra, Italy)

Along the coasts, the subsidence - the vertical displacement of ground surface caused mainly by compaction or loss of material at greater depth - is the cause of inundation and increases the potential for flooding. In the case of historical sites, subsidence may occur either related to a general natural trend of the site, due to geological component, or to anthropogenic factors (ie groundwater exploitation), and its appearance may either be gradual or sudden. The loss of elevation can cause appreciable damage to built structures, such as in Venice, where the forts of St. Andrea and S. Nicolò are affected today by a mean sea level higher than that existing at the time of construction. In such contexts the wave, tidal fluctuations, and moisture transport through rising damp increase the stone, brick and mortar decay.
The geological context permits the understanding of the dynamics of other types of failure when the geological conditions of the sites are to be included among the intrinsic causes.
Moreover, serious damages to the fortified systems of the Mediterranean coasts result from earthquakes and side effects related to the geodynamics of the area. The seismic events are responsible for the phenomena of crushing of the walls provoked by the sussultatory component of the stress, while the undulatory effect is especially damaging for the thrusting structures. The collapse of the less resistant parts is the consequence of the disjointedness usually found in ancient walls which prevents the different parts from working together to contrast the stresses.
Anyway, the response of the fortified structures depends on the geology of the area and on the materials used. The Castle of Kalki (15th century, Greece, Fig.8), located on the edge of a cliff, has

been destroyed completely by earthquakes, frequent along the external arc of Aegean islands. The walls have a nucleus of calcareous stones and external surfaces also in limestone. The good characteristics of the stone utilized are not matched by those of the mortars, weathered by the marine aerosol. The disjointedness in the walls has a fundamental influence on the effects of seismic vibrations, intensified by the steepness of the slope on which the Castle stands.
The Alcazaba of Almeria in Spain, despite the changes made in consolidating the foundation, still tends to be damaged by earthquakes because the structure rests on a bottom layer of fissured rock overlying a more compact rock (Fig.8). The dynamic behavior of the two horizons in contact is significantly different and the effect of seismic vibrations, enhanced at the top of the discontinuity, is responsible for opening new fissures and cracks in the walls after the release of seismic events.
Another significant example of relations between slope movements and tectonics is the Carmona Fortress of Seville (11th century, Spain, Fig.8), located in the area of Guadalquivir, a zone of high seismic risk. The castle and towers were based on a limestone layer covering underneath clayey marl. The failures of the old fortress are connected to the dynamics of the slope, involved by the mass movements repeatedly occurred in the form of lateral expansion (lateral spread) due to the plastic deformation of marl clay, earth flow and rotational landslides.

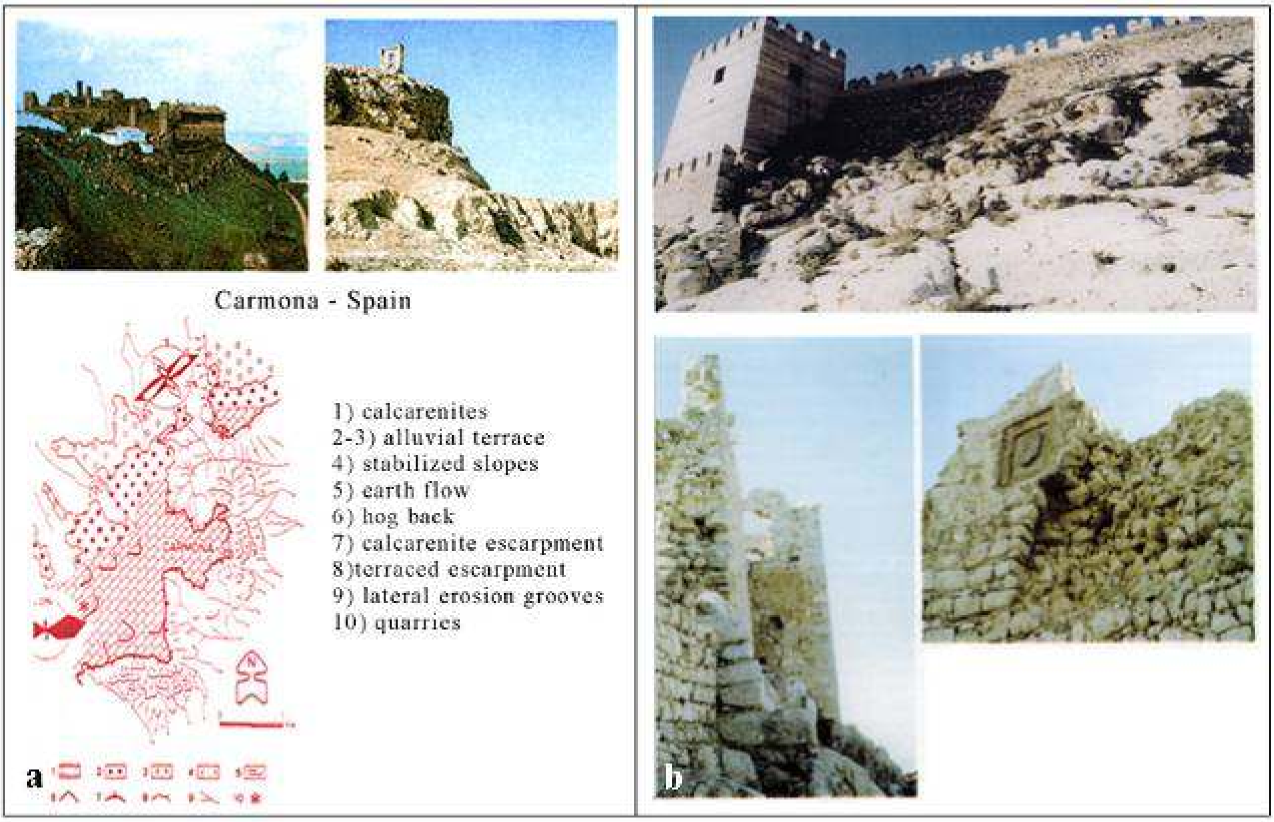


Figure 8: Neotectonics and slope movements: a) failures affecting the Castle and the Tower of Carmona (Spain) due to the dynamic of the slopes; b) effects of seismic activity on walls weakened by marine spray action on mortars (Castle of Kalki, Greece) or intensified by the steepness of the slope and the elastic behaviour of fissured rock (Alcazaba the Almeria, Spain).

CONCLUSION

The fortifications which once served to defend cities, villages and peoples today need to be defended from the expanding city, abandonment and neglect with interventions which, in the guise of recovery, in fact modify and distort the true character of the monument. The causes of degradation, whether intrinsic and extrinsic, natural and man-made, constitute the preliminary knowledge to investigate the relationships between architectural structures and geological-environmental factors. These factors are not a corollary to the planning but a fundamental part of the logical process that aims to identify the most appropriate criteria for selecting the restoration intervention.

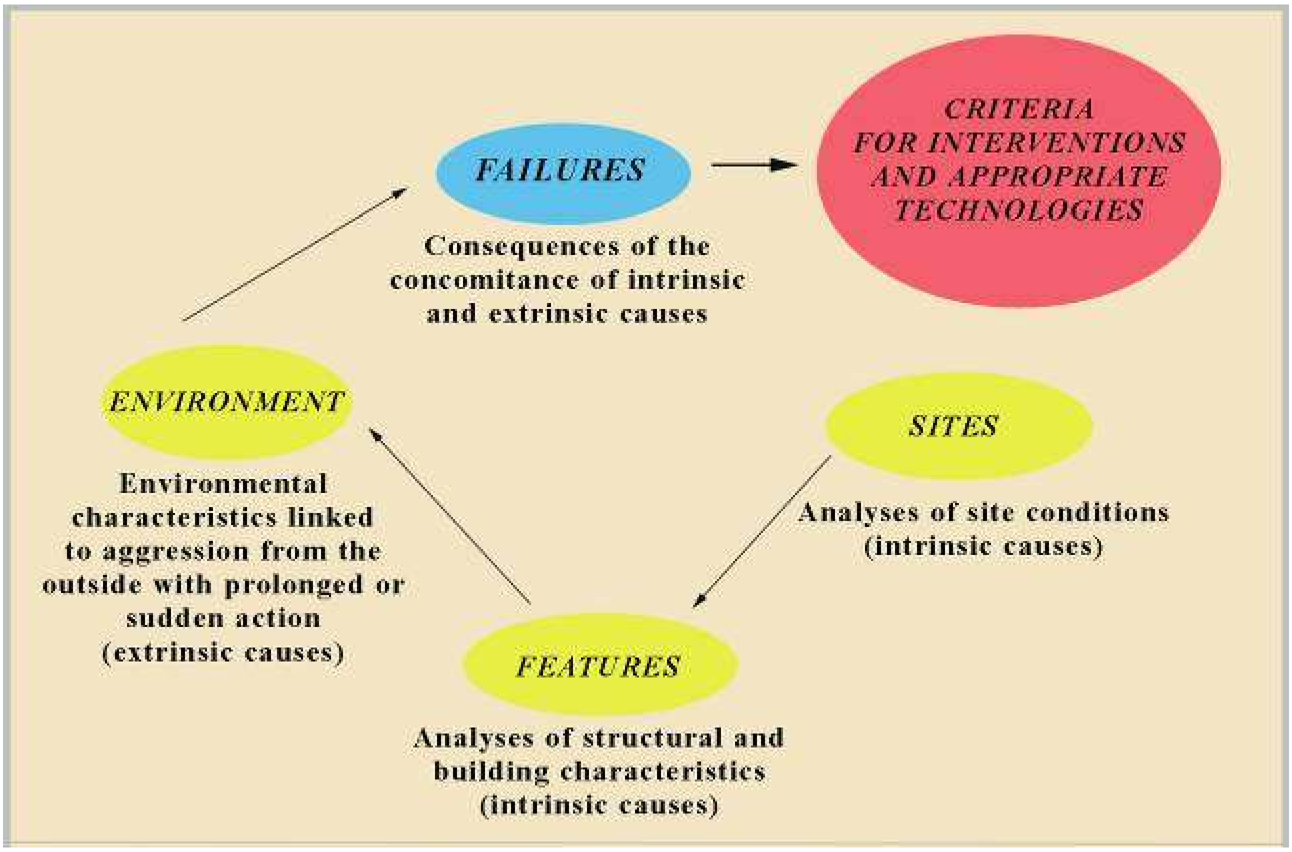


Figure 9: Methodological approach to investigate the ancient structures

As part of the territory the fortified sites are within the framework of the protection of cultural properties. Since these properties are subject to decay, both for the weathering of the stone employed and for the failures of the structures provoked by geological phenomena (slope movements, earthquakes, marine erosion, subsidence, floods, etc.), the monuments are exposed to conditions of risk.
Therefore, the geological knowledge becomes essential to develop a model of the dynamic characteristics of the site hosting the architectural structures. It allows to properly evaluate the conditions of risk because it represents an essential support that uses the information collected and provides the data interpretation in order to prevent further damage and to contain those that have already occurred. The methodological approach here presented consider all the factors responsible for the failures of the defensive systems, as the state of conservation and the dynamic characteristics of the site, allowing to plan activities of prevention and development of the territory (Fig. 9). The scientific community, in this way, is able to formulate a correct strategy to mitigate the risk or to reduce or eliminate the principal causes of danger, together with interventions of technical nature including the consolidation of the structures and the protection of the materials.

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The first is Conservation and Management of Archaeological Sites, whose literature reflects the dual origins of archaeological site conservation in monument conservation and cultural resource management respectively. A second heading, Methods and Techniques for Protection and Stabilization, incorporates individual bibliographies on specific techniques or interventions used to control the deterioration of the site or its components. As a movement, architectural conservation in general, and the preservation of ancient structures specifically, gained momentum during the 18th and 19th centuries. It was a response to Modernism and its corresponding architectural perspective, which eschewed sentimental attachment to old buildings and structures in favor of technological and architectural progress and change.Â Ancient buildings such as the Egyptian pyramids, the Roman Colosseum, and the Parthenon face common preservation issues. The most prominent factors affecting these structures are the environment, pollution, and tourism. As the Earth's climate patterns change, so too do the environmental conditions governing these buildings. Conservation process and significance. A methodological approach to plan shelters in archaeological sites. Article (PDF Available) Â· December 2018 with 56 Reads. How we measure 'reads'.Â Within the scientific debate on the conservation of Cultural Heritage in general and Archaeological Heritage in particular, due to its twofold nature (material and immaterial) and consistently with the interest taken by Technological Culture in the importance of those aspects in the process crucial for their proper development and broad enjoyment, this paper proposes an evaluation model to understand â€˜whatâ€™ to preserve and â€˜.