

## GRAPHICAL ANALYSIS OF HISTORICAL MAPS. TRACES OF INDUSTRIAL ARCHEOLOGY IN THE SOUTH-EASTERN SECTOR OF THE CITY OF CAGLIARI. (SARDINIA, ITALY)

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### Abstract

The contribution proposed is a part of a research aimed at the definition of methodologies for the analysis and representation of the landscape of Sardinia, with particular reference to one of its most important and characteristic versions: the landscape of the wetlands. The history of the city of Cagliari is strongly linked to the sea and the lagoons, elements that constituted the authentic “settlement principle” where the lagoons, in particular, were sources of decisive resources as well as for fishing, for the landing (especially the western ponds) and salt extraction (mainly from the *Molentargius* pond). The case study consists in a part of the regional natural park *Molentargius-Saline*, a system of considerable environmental and landscape value that hosts examples of industrial archeology. Through a multi-scale approach that links traditional and IT tools it is possible to define some representative graphic models of the studied landscape in order to plan its protection and enhancement. The comparison between historical maps and aerial images here presented is the first step of a path of knowledge that explores, analyzes and wants to highlight the most important transformation that occurred in this area since the nineteenth century and a partial preservation of historical cultural landscape.

Keywords: Landscape drawing; Cultural heritage; Industrial archaeology; Sardinia, Italy.

### 1. ARCHITECTURE AND LANDSCAPE OF THE SALINE DI STATO OF CAGLIARI

The research method applied to the landscape of the south-eastern sector of the city of Cagliari required a first phase aimed at a historical-geographical introduction of the area and at the definition of some synthetic analysis on an urban and territorial scale.

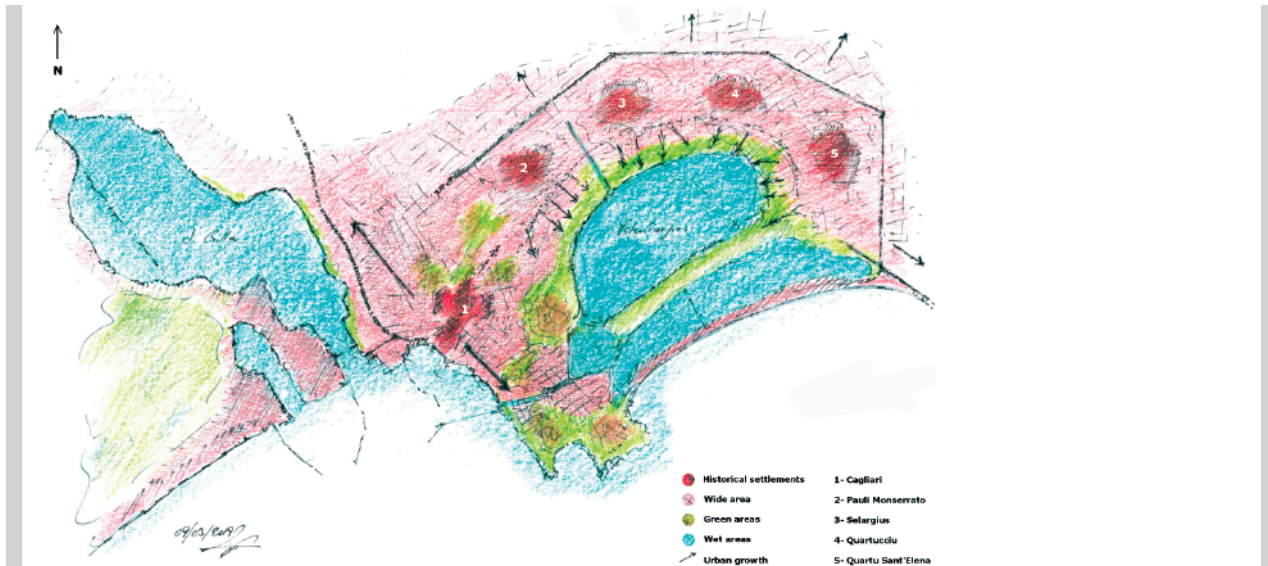
These path of knowledge wants to highlight the territorial determinants that led to a current configuration defined by a sequence of natural elements of extraordinary landscape value such as the hills situated at the mouth of the great *Campidano* plain and the sequence of ponds and coastal dunes concluded by the immense landscape arch of the *Poetto* beach (Fig. 1).

The beach, the wetlands and the salt works are, together with the hills, the most valuable elements of

the landscape in the Cagliari area, the result of water management works carried out initially with only human work, later with the use of animals and finally with mechanical tools.

These elements constituted the authentic “settlement principle” of the area where the lagoons, in particular, were sources of decisive resources: in addition to fishing, the landing place (especially the western ponds) and the extraction of salt (mainly from the *Molentargius* pond).

Based on these fundamental “environmental vocations” the human settlement of the sites will be organized according to a distinction that was established since the stage of Romanization of the territory: west – port facilities and strictly urban destinations, east – settlement structure centered around the pond of *Molentargius* and functional to the extraction of salt;



**Figure 1.** Cagliari landscape context. The graphic synthesis shows the anthropic pressure determined by the urban growth on wet areas

the medieval and modern phases have consolidated this arrangement, rationalizing it and giving it to us well recognizable. The complex “salt machine” is designed and built substantially in its present form in the first half of the nineteenth century by the Piedmontese governments, according to logics completely compatible with the natural functioning of the compendium that nevertheless increase its productivity; it is a transformation that we can read accurately in the maps and projects kept in the archives and dating back to the first half of the nineteenth century.

In its current configuration, scaled down compared to the nineteenth-century dimension, the wetlands is included within the *Molentargius-Saline* natural park in the territories of Cagliari and Quartu Sant’Elena and protected by regional and European laws; the entire compendium extends over more than 1,600 hectares and contains an architectural heritage of considerable interest, consisting of structures at the service of works and iron bridges, integrated in the recent period by civilian buildings scattered throughout the earth strip included between the ponds and along the ancient routes and the strategic presence of a system of small bunkers useful during the Second World War to control the network of land and water routes.

## 2. THE DRAWING/DE-SIGN OF THE PIEDMONTESE SALT WORKS

The study area preserves the signs of an ancient frequentation and a continuous use mainly linked to the control of the landing places and to the exploitation of the resources of the salt works.

This use has determined the maintenance of a system of paths on which urban growth has been grafted – linked to the presence of military and industrial structures – that we can know in depth through the comparison between the nineteenth-century maps and the most recent aerial surveys.

The nineteenth-century representations in particular describe the “modern” project of the Piedmontese salt works [1] in a landscape context characterized by a strong natural component and the presence of the infrastructural network that will guide the development of the city towards the coastline.

The historical maps selected for the present study are characterized by a scientific rigor that foresees the widespread use of the graphic codes shared in the European area starting from the early nineteenth century but also for the strong communication skills offered by the wise use of colors and shapes that show the wetlands and the persistence of cultivated fields, the latter destined in the second half of the nineteenth century to completely disappear.

The cartographic database thus constituted is characterized by a remarkable detail and care in the repre-

sentation of the elements of the landscape and a quality of the data that allows an easy graphic overlay with the most recent cartographic productions; this condition allows a diachronic analysis of the transformations and through the decomposition and recomposition of the interpreted signs, the definition of some graphic models that highlight expansions and contractions of the different landscape units.

In this phase, the re-drawing of the archival document assumes considerable importance as a tool capable of leading with the right timing an investigation path aimed at communicating single or integrated aspects that contribute to the global design of a landscape always in a dynamic balance, in continuous movement; accepting the operational lines of structuralist current and with the aim of defining an operational methodology, therefore we decompose the landscape into its constituent parts in order to classify them and then reassemble it in order to understand the relationships that join the individual parts and each of them to all [2]. To this end the graphic information is structured to lead to a reasoned redrawing, the result of graphic choices obtained with the omission and /or sometimes the emphasis of some signs and with the use in the digitalization of different graphic primitives – in function of a suitable representation of the sign with purely “artificial” (lines, polylines) or “natural” (splines) – and thicknesses and line types – in relation to the “landscape” weight of the objects represented.

The first document examined is the map of Captain W.H. Smith who, as it is well known, will contribute to the compilation of the Map of the Kingdom of Sardinia – published in 1845 by General Alberto Ferrero Della Marmora – with the data relating to

the soundings represented by three different types of lines (according to the increasing depth) and carried out along the coasts of the entire island.

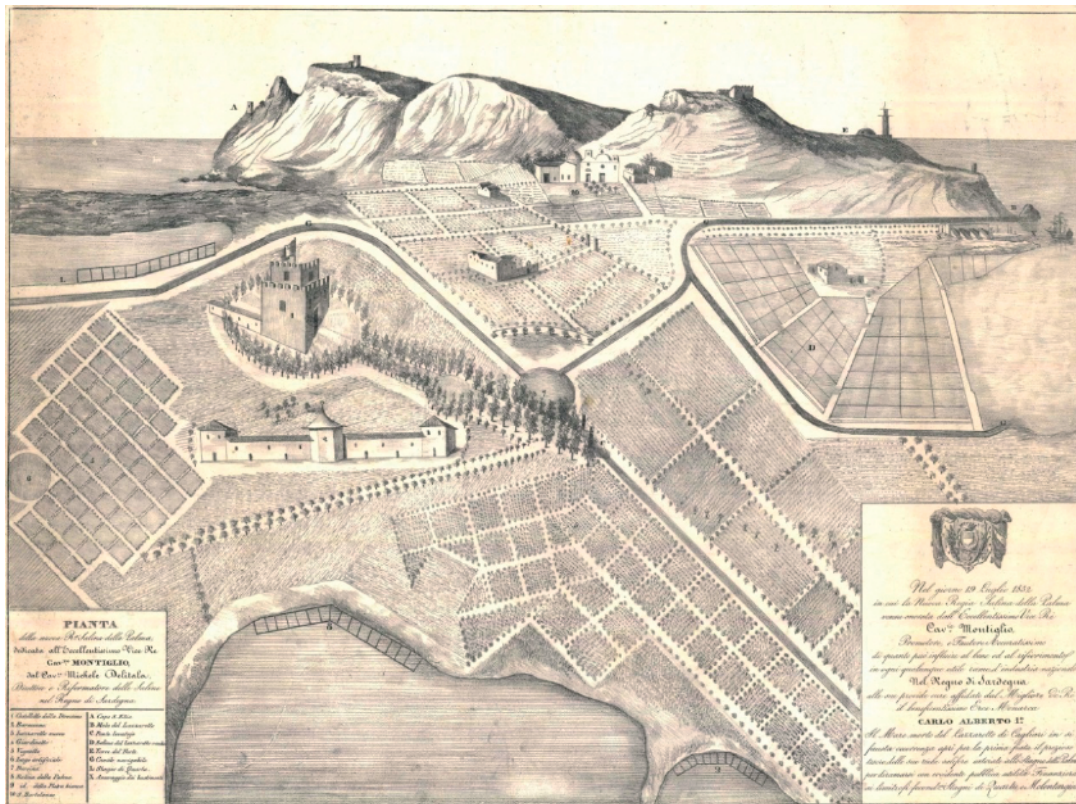
The map, engraved by J. & C. Walker, entitled “Sardinia Cagliari Bay”, in scale 1:27.000 oriented and with metric scale, is dated 1823, accurately describes the stronghold and its suburbs (with a perfect correspondence with the coeval map of Luigi Ferrero Ponsiglione, a military officer) and the physical and anthropic components of the landscape of a large portion of the Gulf of Cagliari; the coastal towers are correctly identified (although in some cases with a wrong name such as the *Carcangiola* tower that replace that of *Poetto*) as well as the church of S. Bartolomeo, the new *Lazzaretto* (isolation hospital) and the old *Lazzaretto*, and the dense network of the routes that connect the city to farms and cultivated fields located between the salt works of *Lazzaretto*, the *Poetto* seafront and close to the Cape S. Elia (Fig. 2).

The document is very interesting because it precedes the works aimed to improve the salt works undertaken in the 1930s and because it accurately transmits the signs of a landscape that today we can only partially observe. The shapes of the territory are described with rigor where the orography is represented with the typical “oblique light line” suggested by the *Mémorial* prepared in 1803 by the French commission which, following the examination limited series of cartographic productions chosen as representative examples of the state of the art in Europe, declares itself in the “merit of the purposes and uses of the cards, discuss their contents, provide indications on the construction procedures ... and on the training of the men called to perform the topograph-



**Figure 2.** Detail of Captain Smith’s map (Accardo-Fontana private collection, Museo Casa Manno, Alghero-Sardinia). The graphic elaboration shows the relationship between the territorial determinants (system of hills and wetlands) and the historical settlement





**Figure 3.** View of 1832 in which the following are represented: 1 – Management building of Salt works, 2 – Building, 3 – new Lazzaretto, 4 – Garden, 5 – Vineyard, 6 – Artificial lake, 7 – Dock, 8 – Salt work of La Palma, 9 – Salt work of the Pietra Bianca, A – Cape St. Elia, B – Pier of the Lazzaretto (isolation hospital), C – drawbridge, D – Salt work of the old Lazzaretto, E – Tower of the fort, G – Navigable Canal, L – Pond of Quartu, X – Anchorage of ships (document kept in ASCC, the historical archive of the municipality of Cagliari)

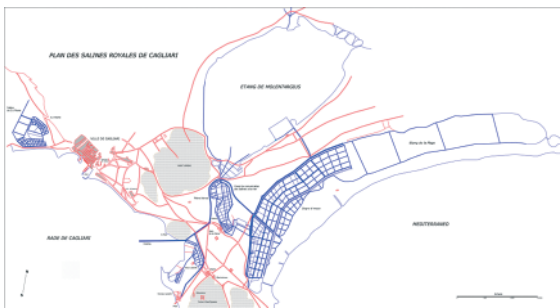
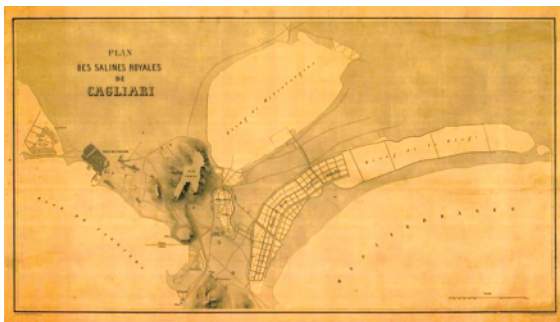
ic operations” [3]. This description is supplemented by some elevation data and toponyms linked to the history of the places (for example *Pt Vergine* near the church of Nostra Signora di Bonaria and *Pt Salina* in the immediate vicinity of the Lazzaretto salt works, today disappeared but whose design is still visible in the aerial photos until the 1968). All of these described elements correspond to the view of 1832 (Fig. 3). In this representation we can observe the landscape context of the *nuova Regia salina della Palma dedicato all'eccellentissimo vice Re cav.re Montiglio dal cav.re Michele Delitala, direttore e riformatore delle saline nel Regno di Sardegna* composed by industrial architecture and natural elements. In fact, only from that date started the works of technological reorganization and hydraulic arrangement of the *Molentargius* salt works begin, through the construction of a system of canals that discharge the fresh water into the sea and feed the tanks with salt water, which we observe in a further document of the time (Fig. 4).

The second map analyzed (Fig. 5) is called “Plan des salines royal de Cagliari” and was realized in the middle of nineteenth-century; the map is compatible – like the map of 1823 – with aerial images provided by the Cartographic Service of the Sardinia Region. Analyzing the images of 1940–45 we clearly observe the drawing of the nineteenth-century salt works of Lazzaretto (which overlooks the bay represented in the nineteenth-century view in Fig. 6) and of the canal that runs along it (Fig. 7) completely lost in the 1970s with the construction of the new Sant'Elia district and the implementation of a new road system. The drawing, in addition to showing the successful realization of the ordered system of the canals that connect the salt system with the ponds and the sea, identifies a series of new architectures including the penitentiary (1842) and the first nineteenth-century buildings, the warehouse system and the salt dock. The route system here represented appears to be rationalized and rectified; it no longer leads to cultivated land and shows some axes that will become important for urban development, including the cur-





**Figure 4.** “Piano di tutte le saline erette, e da erigersi nel circondario di Cagliari” that describe the plan of all the erected salt works and to be erected in the district of Cagliari (19<sup>th</sup> century document kept in ASCA, the State Archive of Cagliari)



**Figure 5.** Original document (kept in ASCC, the historical archive of the municipality of Cagliari) and graphic elaboration of the nineteenth-century map aimed at showing the strong landscape design of wetlands



**Figure 6.** Penitentiary (n.32) and new Lazzaretto (n.34) in the drawing realized by the piedmontese military officer Carlo De Candia and published in Della Marmora 1860. On the right of the drawing we can recognize the wide bay that delimited the ancient salt works of the *Lazzaretto*

hold which shows only the medieval *Marina* district, the salt works and the small church of *San Pietro* near the pond of *Santa Gilla*.

rent *Poetto* street in the NO-SE direction. The work is completed by a partial representation of the strong-

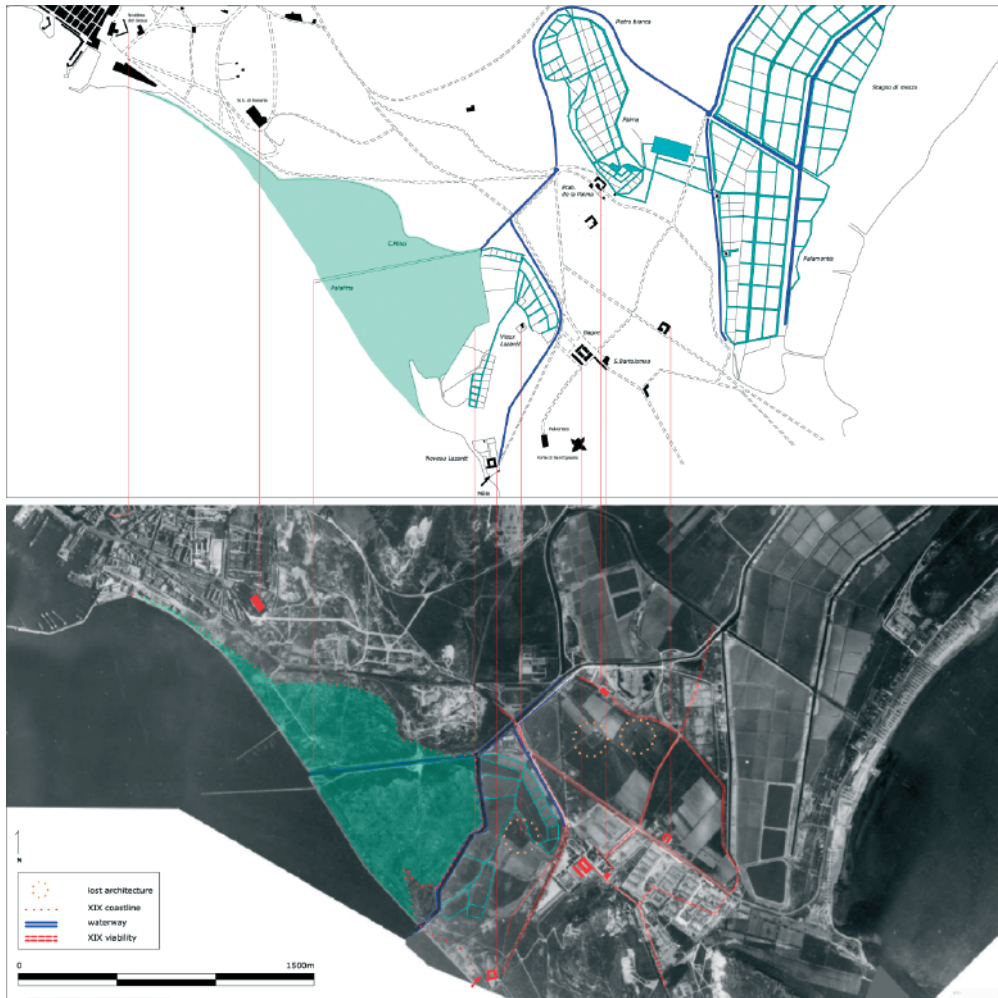
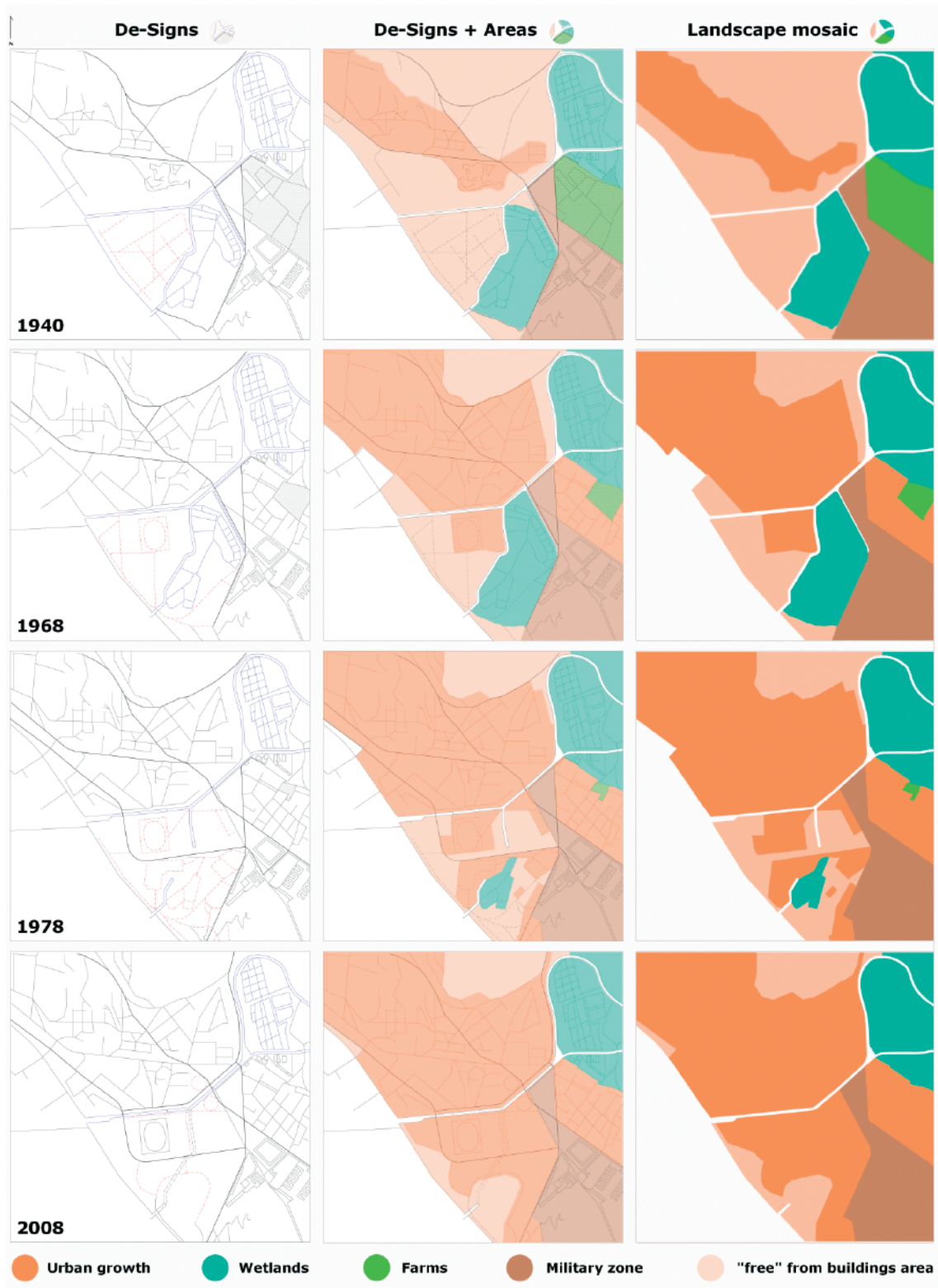


Figure 7. Graphic correspondence between the nineteenth-century map and the aerial photo dated 1940–45; the comparison shows the modification of the coastline and the permanence of *Lazzaretto* Salt works traces, the position of the church of S. Bartolomeo, and it allows to identify the position taken by old *Lazzaretto* and by the farms represented in the view of 1832 (identified in Fig. 3 by the letter G)



Figure 8. The historical city and the study area seen from Calamosca hill (drawing by P. Solla, scientific coordinator A. Pirinu)





**Figure 9.**  
 The synthesis shows the urban growth that occupies the salt works of the *Lazzaretto* and the areas immediately behind the pond of *Molentargius* leaving only a few areas free from urbanization. The presence of the canals is not a problem for the development of the city plan unlike the military zone which – like a bastion – restricts the occupation of the area of *Sant’Elia* and *Calamosca* performing (unconsciously) a protection of historical landscape that today becomes an important value for the city





**Figure 10.** Relationship between landscape components and territorial dynamics in the study area (on the left); the landscape context of Cagliari represented on an aerophotogrammetrical survey dated 1998 integrated with the use of aerial images of 2008 (on the right)

### 3. REPRESENTING THE LANDSCAPE TRANSFORMATIONS

In the search for define an image of a territory we can aim at the representation of the appearance that characterizes it or at the representation of the phenomena that lie behind it [5].

The cartographic analysis on an aerial basis returns an image conceived as a two-dimensional idea [6], highlights the organization of the urban fabric and allows a diachronic reading of the transformations of a precise territorial context. Its representation can take place through graphic models that, although deriving from the forms acquired through digital survey methods, are characterized by a perceptive component and linked to the phenomena that led to the current territorial structure [7]. The possibility of graphic overlay among the selected documents offers the opportunity of a careful study of the transformations of the historical landscape and the identification of the traces of the disappeared assets. Through the use of traditional and digital tools the precise data offered by recent information technologies becomes the means capable of communicating even the most complex analyzes to a vast public.

The aerial images employed show since the 40s of the twentieth century the advancement of the coastline and the occupation of the bay between the exit of the canal of the *Palafitta* and the western limit of the ancient salt works of *Lazzaretto* and the verification of the persistence until the end from the 60s of the twentieth century of the farm shown in the view of

1832 and recognizable in the map of 1842.

The analysis of the documents also makes it possible to identify the position of the old *Lazzaretto*, the presence of cultivated fields in the area between the *Sant'Elia* hill and the canals where, starting from the 1960s, the new districts of *Quartiere La Palma* and *Quartiere del Sole* will be built. A progressive saturation of the area well documented by the aerial photos of 1968 where the realization of the new Sant'Elia stadium will in fact determine the beginning of an important transformation of the natural landscape and the loss of the system of *Lazzaretto* salt work. In the decade 1968–1977 the new viability “breaks” the canal – once the margin of the salt works of *Lazzaretto* – of which today we observe only the exit section. Finally, the last image analyzed and dated 2008 highlights the complete urbanization of the Sant'Elia area – which retains only a trace of the ancient canal – and the strong sign of the fast scrolling axis on the urban structure of the contemporary city (Figs. 8-9).

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