

KNOWING THE PAST FOR MANAGING THE PRESENT: A COMPARISON BETWEEN HISTORICAL CARTOGRAPHY AND SATELLITE IMAGES FOR THE STUDY OF ROME'S CITY CENTRE

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Abstract

The idea of this paper, develops from the consideration that, since the second half of the XXth century, urban planning of Italian historical centers seems constrained by the fear of compromising the architectures of the past. Rome's city centre, today UNESCO site, gathers a built up heritage that witness its long and unique existence. The missing industrialization phase that, during the XIXth century, determined the urban transformation of the great European capital cities, has permitted to a large area characterized by highly stratified urban tissue to survive. The aim of this project is to exploit the geometric precision and descriptive detail, characterizing the "Nuova pianta di Roma", published in 1748 by Giovanni Battista Nolli, for studying the urban transformations at housing block level. The rigorous georeferencing of the historical cartography, allows for the spatial comparison with actual cartographies and with very high resolution satellite images, and the consequent analysis of the urban structure and its formal and functional contents.

Key Words: Rome's City Center, georeferencing, historical cartography, spatial comparison.

INTRODUCTION

The aim of this paper is to present a first attempt to reconstruct the evolution of green areas of Rome inside the Aurelian Walls. In particular we focused our attention on the period from 1750 to the present.

Originally the city of Rome was surrounded by green. There were forests such oak, beech forests, but also a lot of grassland. The ancient Romans used these trees as symbols of command and supremacy: in fact, they planted trees in the squares to celebrate victories. The woods met needs of citizens on one hand, but also had a religious significance. Many of these sacred woods were on Esquilino, Campidoglio and Palatino hills. In addition to these forests in the city there were the sumptuous residences of the roman aristocracy with cultivated areas near them, called horti. During the time horti improved their appearance with flowers and ornamental plants and they became public green areas (*Tagliolini, 2006*) During the Imperial Age there was a significant change in urban structure because villas took the place of cultivated areas, but this ended with the burning of the city (and in particular of imperial residences and horti) during the Barbarian Invasion. The magnificent gardens flourished again after 1000 years during the Renaissance. As the century progressed this green areas disappeared and were built new districts.

Moreover with this study we tried to demonstrate the presence, in the past, of green areas also in historical centre because it is the centre of a strong modern debate about urban planning.

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The idea of this work started after a strong debate about the restyling of one square in Rome: Piazza San Silvestro. It is now one of the largest square in the historic centre of Rome and from 1890 it has become the terminal of the first electric tramway and after the terminal of a lot of urban buses (**Fig. 1**).



Fig. 1. Piazza San Silvestro before the requalification.

In 2011 started the work of requalification and restyling of the square; the project was assigned to a famous Italian architect, Paolo Portoghesi. The main goal of this requalification project was to remove several bus terminals and to transform the square in a pedestrian precinct for the citizens (**Fig. 2**). The original project was to create some green areas inside the square, but finally the square was restored without trees and flowerbed (probably thinking that originally there was no green areas in this site) and it is now completely paved. This consideration created a debate and with this work we tried to individuate public and private green areas on historical maps in order to compare them with the present status. Despite the case of San Silvestro, which indeed was paved, our aim is to show that there were many other places, located also within the urbanized area, that were originally green.



Fig. 2. Piazza San Silvestro after the requalification.

2. DATA

To study the evolution of green areas over time we vectorized the polygons of green areas on a historical map (we used the *Nova pianta di Roma* by Giovanni Battista Nolli published in 1748) and afterwards we repeated the vectorization of the green areas also on a modern cartography (we used an official 1:5000 scale map updated to 2003/4). Finally we made a comparison by overlapping the two vectorized maps. For our study and for vectorizing the polygons of green areas both on historic and modern cartography we used an open sources GIS software QGIS v.1.8.



Fig. 3. The great plan of Rome' G.B.Nolli 1748.

As historic cartography we used the map of Nolli 1:3000 (about) scale map of 1748. (**Fig. 3**) Giambattista Nolli was an architect and surveyor who lived in Rome and devoted his life to documenting the architectural and urban foundation of the city. The fruit of his labor was «The New plan of Rome», published after 12 years of work. This map is an ichnographic plan map of Rome that remains one of the best sources for understanding the transformations of the contemporary city (*Bevilacqua, 1998*).

Nolli depicted the urban centre of Rome using a scientific surveying techniques. The city was represented with an exactitude that immediately allows to compare size, position and shape. The border consist of decorative elements and medallions that are regularly interspersed with the symbols of the 14 Rioni defined by Bernardini (*Bevilacqua et al., 2012*).

The Nolli's map used in this work was georeferenced in earlier works using IRAS-B Intergraph software and a third order polynomial function with more than 50 points acquired in a differential GPS static mode (**Fig. 4**). At the time of these works the accuracy of map was estimated in 4 meters (*Baiocchi et al., 2001*).

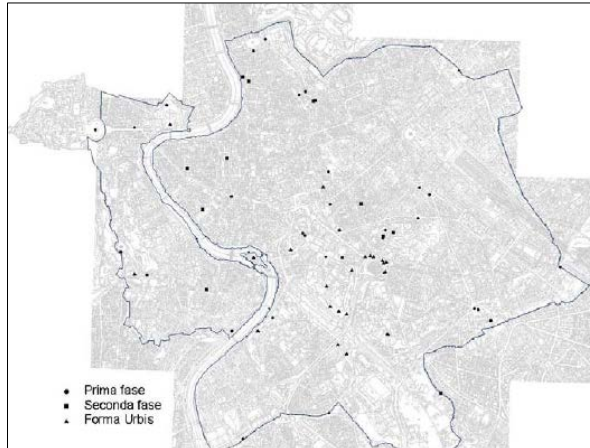


Fig. 4. Distribution of GPS point acquired for georeferentiation of Nolli's map. (after *Baiocchi, Lelo, 2001*)

The classification and the vectorization of green areas on Nolli's map was easy and immediate thanks to the evocative way in which Nolli depicted them. First of all, in fact, Nolli lists various type of land use such as the so called orto, villa, vigna, etc. and depicted each of them with a specific symbology on the map (**Fig. 5**). Nolli's representation of plant materials and crops on his map was used for our classification even if some authors are uncertain whether or not he had specific idea of plant materials and crops. However in his detailed depiction of Rome, Nolli describes each green area within the Aurelian walls. There are at least a dozen distinct graphic symbols used: trees, rows or furrowed fields, mixtures of the two along with corn-like emblems constitute the most common landscape symbols (*Ceen et al., 2005*). After the study on Nolli's map, we repeated the vectorization and the classification of green areas inside Aurelian Walls also on a modern map. We used a 1:5000 scale map (CTRN) of Lazio region. For the vectorization on this map we used also high resolution satellite images as a support to identify green areas and their specific use.

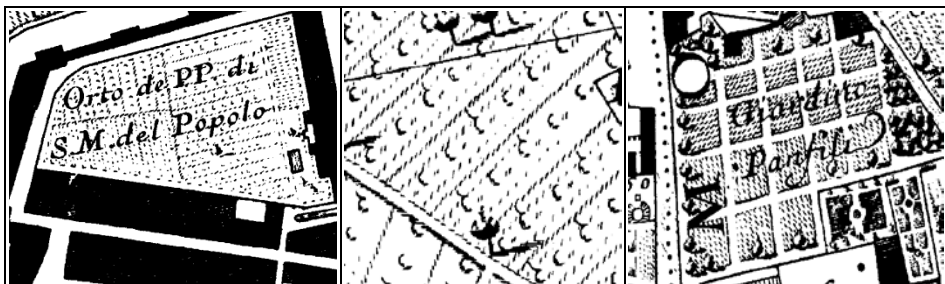


Fig. 5. Different symbology used on Nolli's map to represent different type of green areas. [a) orchards, b) vineyards, c) gardens]

3. RESULTS

On both historic and modern cartography we interpreted the graphical schemes utilized by Nolli to describe different types of open areas to create the following classification scheme:

- gardens, in which we included public gardens and private gardens near the buildings;
- woods
- cultivated land (vineyards and orchards)
- spontaneous green, for example “canneti” (cane thicket).

After this step we tried to identify the type of access for each green area. So we differentiated public access from private access; we considered public access when there were no walls around or there were walls with gate, while private otherwise. This distinction is important to distinguish green areas accessible and enjoyable for all the citizens from the private areas.



Fig. 6. Private green areas along Via delle Sette Sale (from right to left in the center of the image) on Nolli's map.

But sometimes this distinction generates ambiguity because some green areas, even if surrounded by the walls and inaccessible to the public, represents 'green lung' for all the citizens. An example of this is represented by the areas along Via delle Sette Sale that is still as it was during Nolli period. (**Fig. 6**). Along this street there was a wall that surrounds a cultivated area, so it was classified, on Nolli's map but also on modern map, as private access area. Anyway the trees are visible and this green area is usable and enjoyable by the citizens so it has a different value than that of real private gardens.



Fig. 7. Satellite Image of private green areas along Via delle Sette Sale.

In **Fig. 8** is shown the result of vectorization and classification on Nolli's map. It is evident the predominance of cultivated lands, while there are less gardens (although their extent is significant compared to those in other contemporary cities) and woods. The gardens are often private gardens inside the courtyard of palaces or villas.

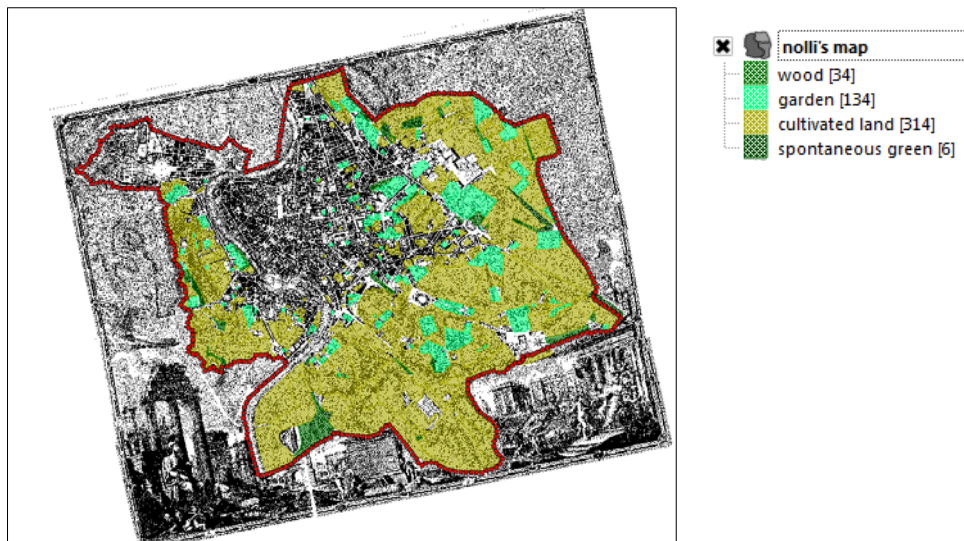


Fig. 8. Result of classification on Nolli's map.

In **Fig. 9** is shown a graph of distribution of green areas in different classes. The largest class is those of cultivated land, as we can notice also in **Fig. 8**.

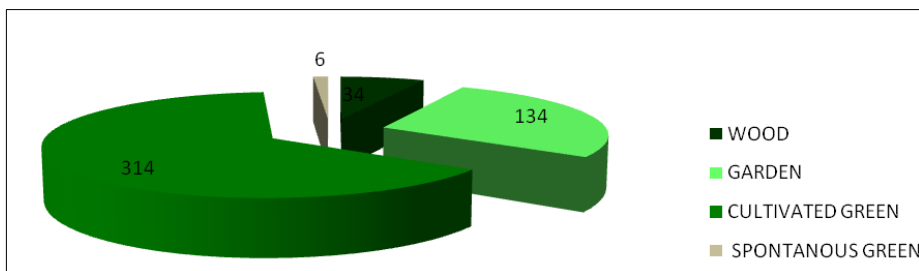


Fig. 9. Classification of Termini Station's area on Nolli's map.

Now we want to analyze some significant examples of some areas and their evolution during the period considered in this study. First of all it is reported the example of the area that today is occupied by Termini Station. In 1750 (**Fig. 10**) this area seemed to be a cultivated area (vineyard and vegetable garden) with private access (such as Villa Negroni, Villa Rondinini, Villa de' Vecchi Vigna de' Celestini etc.).



Fig. 10. Classification of Termini Station's area on Nolli's map.

On modern map instead in the same area there is Termini station and only some public garden, such as Piazza Dante, Piazza Vittorio Emanuele etc. (**Fig. 11**). About this areas shown in **Fig. 10** we can say that in 1789 French troops occupied Rome (then about 180,000 inhabitants) and established the first Roman Republic. Between 1800 and 1809 the troops of the Neapolitan Bourbons reinstated the papacy, but in 1809 Napoleon's troops reoccupied Rome and, by subjecting the papal state to direct imperial government, made Rome to become the capital of the Kingdom of Italy and the second capital of the Empire. The French administration chaired by the Prefect Count Camille de Tournon developed an extensive program of modernization and embellishment of the city, and to realize this project were engaged Roman architects such as Raffaele Stern, Giuseppe Camporesi, and Giuseppe Valadier. The program was divided into different phases of implementation and

concerned: “annonari” and functional interventions, recovery of archaeological work (excavation of the Roman Forum, the Colosseum, the Forum of Trajan and the Ulpian, interventions of embellishment: the Tiber, a "Park of great Caesar" from the Pincio to the Tiber river, monumental arrangement between the Colosseum and the Capitol, extensions of the squares of the Pantheon, Trevi Fountain, Veneto, the Chancellery, Trajan's Column, demolition. The French interventions were particularly important for the embellishment of the city and public health (Lugli, 1998).

In this change during the time the urban aspect was modified and also the type of use and the type of access of green areas. During the nineteenth century in fact, because of lotting, the citizens lost some of most beautiful “villas” such as villa Ludovisi.



Fig. 11. Classification of Termini Station's area on modern cartography.

Another significant example of what we are studying is shown in **Fig. 12** and **Fig. 13**.

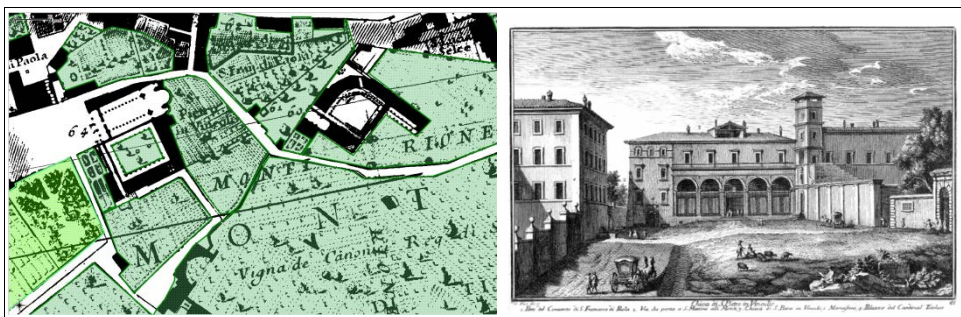


Fig. 12. Cloister of San Pietro in Vincoli (1750).

In this picture is shown the courtyard of Engineer Faculty of 'La Sapienza' University that was part of famous church San Pietro in Vincoli. Around ten years ago the pavement of courtyard was restored using a brick coverage, thinking that it was the original paving. Observing Nollí's map we can observe that it isn't true because it was a green area also if private. So this area were green area while now it is paved.

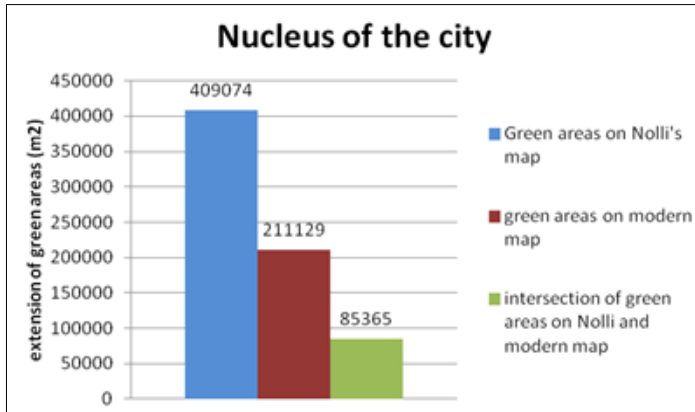


Fig. 15. Extension of green areas on the two maps and their intersection(Nucleus of the city).

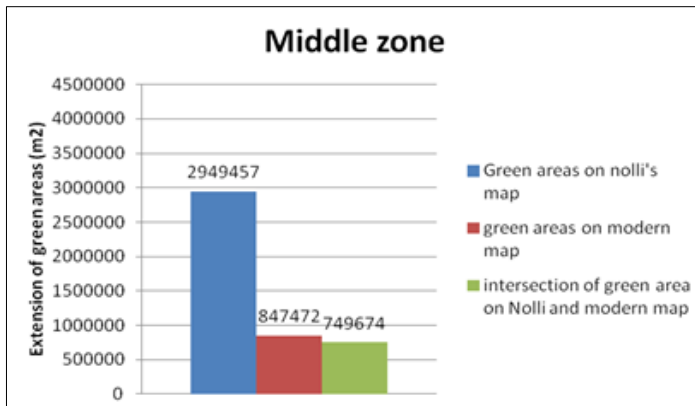


Fig. 16. Extension of green areas on the two maps and their intersection (middle zone of the city).

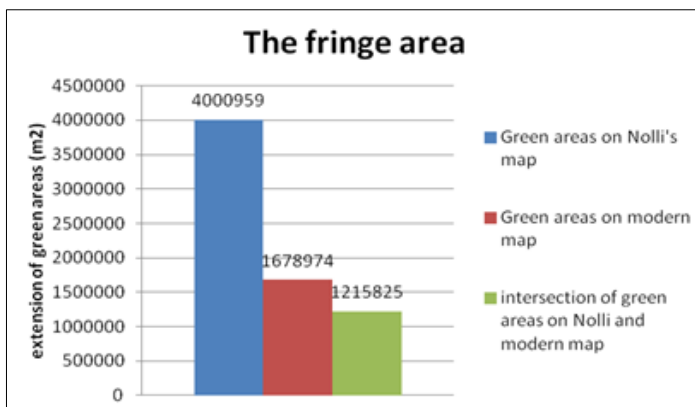


Fig. 17. Extension of green areas on the two maps and their intersection (the fringe area of the city).

Considering areas common to both maps we can calculate the difference, in term of extension of green areas, between Nolli time and present. It's evident that the center of the city is the part in which there have been less significant changes since it represents the part already constructed at the Nolli time. Instead, the most important changes of extension is noted in the external part of the city, from which the green areas (in particular the cultivated land) disappeared, leaving the place to buildings.

4. CONCLUSIONS

The study on the historic evolution on green areas in the city center of Rome showed that at the time of Nolli (1748-1750) the most part of the centre of Rome was green and even if not all the green was accessible by the citizens it was anyway enjoyable by them. Obviously this is only a first attempt to compare what it was with what it is nowadays the green, and systematic analysis and investigation have to be done. GIS techniques are particularly useful in this context, since they offer the possibility to fastly detect and measure changes. However, we can observe that some areas of public green existed also at the Eighteenth century and not all of them were preserved in modern urban form. Moreover, if we continue to increase paved and asphalted areas in order to preserve original aspect of the city center, neglecting that, on the other hand, some old cultivated areas were now replaced by buildings this will change further the climate and environment of the city, already deeply modified from the time of Nolli.

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