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An information layer for the historical mapping of Pisa

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This digital history work is a simple example of how it is possible to use a GIS and WebGIS in the humanities, such as history, and obtain results that are outside the scope of traditional research. In order to achieve this objective and assess the toponyms, no-longer-existing architectural infrastructures and production activities, we employed primary and secondary archival sources, as well as meta-sources implemented in GIS environment.

Keywords: Catasto Generale della Toscana (General Land Register of Tuscany), history, factories, Historical-GIS, toponyms.

This report will describe how the use of IT applications in a historical case study, i.e. the city of Pisa between the modern and contemporary ages, has produced very interesting results that would be difficult to achieve with the sole use of traditional historical techniques.

The survey was structured into various phases and consisted in examining the toponyms, production activities, infrastructures and topographic structures no longer existing in the city. The study started by analysing the *Catasto Generale della Toscana* (General Land Register of Tuscany – 1819-1835) and then moved back in time as far and as much as possible. This highly ambitious project was carried out using primary archival sources (mapping, taxation and census archives), secondary archival sources (publications throughout the territory) and meta-sources implemented in GIS environment and published online with WebGIS. The information collected was located and positioned in its original location using geographical information systems, thus allowing a diachronic reconstruction of the place names and of the uses of the urban and peri-urban areas of Pisa.
The main distinctive features of this study were the enormous amount of data handled, the computational automation provided by the digital technique – necessary for management of all the information -, and finally, preparation of the geographical databases for publication with open source WebGIS applications (Noti 2012:87-95; Anichini, Gattiglia 2012:73-85).
Since GIS is a tool that builds knowledge, WebGIS is the device that communicates the information produced (Rowland 1996:53-57; Vitali 2004; Rowland 1991:704-708; Zorzi 2000: 274-291). The digital diffusion of knowledge, especially in the web 2.0 world, no longer moves in one direction; the circulation of information allows multi-directionality of related collective contents: this is the distinctive aspect of metadata (Numerico, Fiormonte,Tomasi 2010). The effects of digital technologies, therefore, influence data management and, consequently, historical discourse, which is no longer solely criticism of sources and interpretation of documents but – since enriched by all the documentary material – is published online and is freely accessible. The contents and containers are part of the same platform «which combines data and sources with interpretation and synthesis»; research does not end with communication, on the contrary, it grows thanks to its networking (Calanca 2010).

1. Sources

A first crucial distinction must be made between classical or analogical sources and digital or immaterial sources. Both types of information were widely used for this study. Regarding the first group, archival sources (taxation, textual and mapping sources) were used as well as published documents covering historical and architectural issues related to Pisa. For the second group, instead, we used the numerical mapping sources of Regione Toscana (*Carta Tecnica*

Regionale – Regional Technical Map), the online mapping catalogue created by Prof. Lucia Nuti of Pisa University (*Atlante storico iconografico delle città toscane* – Historical and iconographic atlas of Tuscan cities) and WebGIS maps of the Tuscan SIT (Geographical Information System): CaStoRe[1].

Before analysing the documentation in detail, a brief introduction on the status of the work carried out by 2.0 historians and on how this has changed following the introduction of new digital technology is necessary. The first aspect that must be considered is the relationship between the historian, or more generally the humanist, and sources. The migration of archival data – whether serial or not – in a database, is a fundamental step which involves accurate choice of the information collection procedure. Data storage, even of homogeneous sources such as taxation or land register sources, always presents parameters of subjectivity – i.e. the personal viewpoint of the author of the document – which the digital historian must keep in mind (KENNETH PIKE 1967; GINZBURG 2001:905-913).

Regarding the traditional historical approach, this basically rigid practice can be divided into three separate and sequential phases: collection of information from primary and secondary sources, analysis of data collected in explicit or implicit form, and the creation of a text containing the interpretations reached. With the advent of IT and, especially, of ICT technologies, this order practically fell apart.

Sector experts have emphasised how the procedures used for entering/collecting data in the digital system alter «the relationship between the historian and the sources (the universe of documentation available) and the construction of historical discourse» (ROWLAND 1996:62).

In the digital era, the connection between the historian and sources goes through a twofold transformation. The first is directly related to the amount of documents which are presented on CD, DVD and Web formats, thanks to the digitisation techniques used by many public institutions; the second, instead, regards the possibility to publish the «entire script» (TRIGARI 2010) – historical discourse and sources –, thus reducing printing costs and reaching a potential public of over one billion users[2].

Alongside these document storage and indexing skills, issues have also arisen regarding the new relationship between historians and source acquisition procedures (VITALI 2004:11-13). The work carried out by digital historians no longer consists of the traditional use of documents; the introduction of new IT tools has made them become documentarians and digital archivists.

Oscar Itzcovich was the first to point out how the use of PCs for the digitisation of documents in specific databases unavoidably leads to the creation of «a new source, 'built' by the historian himself»; by selecting the documents – a technique already used by traditional historians – the historian chooses «from a large amount of information, the few items he considers significant» for his research (ITZCOVICH 1993:41-42).

When speaking of digital archives, therefore, we must think of a set of products in which heterogeneous sub-sets of resources co-exist. Simple digital reproductions of documents are available (usually photographs or scans) rather than documentary transcriptions resulting from critical publications of the sources (ZORZI 2000:275; VITALI 2004:30-34).

The diffusion of PCs in the 1980s and the gradual transfer of digital historical research from centralised mainframes to decentralized personal computers led to the proliferation of commercial software which, already at the start of the 1990s, «drove many historians to use programmes such as Lotus 1-2-3, dBase or Reflex for handling their records» and increased new meta-sources (ROWLAND 1996:51; ROWLAND 1991:704-708).

The first aspect that historians must deal with when addressing the computerisation of sources is the source/model oriented method for the acquisition of documents (DENLEY 1994:33-43). Naturally, there are many nuances and intermediate solutions between the two source-transfer methods from object to virtual – «the former regards full acquisition of the documentation, whereas the latter places emphasis on the "facts", i.e. on the information more than on the source itself» (VITALI 2004:15).

1.1 Material sources

Analysis of the sources used will start from the archival materials.

The first and undoubtedly most important source is the documentation (maps and registers) of the *Catasto Generale della Toscana* (General Land Register of Tuscany). One of the most important contributions to this land register (also called *Leopoldino, Ferdinandeo-Leopoldino, Catasto Toscano* or new land register) came from Giuliana Biagioli, who studied this source from both a quantitative and qualitative viewpoint (BIAGIOLI 1975). The *Leopoldino* is a geometrical parcel land register created for the entire Gran Duchy and which uses geodetic principles for the first time in Tuscany. This taxation census of the territory which, like the French model from which it takes inspiration, was carried out using modern sy-

1. Regione Toscana, as part of the CASTORE (CAtasti STOrici Regione Toscana – Historical Land Registers of Regione Toscana) project digitally reproduced and then georeferenced over 12,000 maps regarding its pre-unity land registers: Toscano, Borbonico and Estense. http://web.rete.toscana.it/castoreapp/. [Access: December 2010].

2. According to a study diffused by ComScore Metrix World, total global Internet users surpassed 1 billion at the start of 2009. 77% of these users habitually use Google programmes, i.e., applications that operate on the basis of GIS systems featuring information levels (roads, aerial photographs, points of interest, etc.,) which act upon a system of geographical coordinates. (http://www.comscore.com/Press_Events/Press_releases/2009/1/Global_Internet_Audience_1_Billion) [Access: December 2010].

stems entrusted to public officials directly by the central State. The Gran Duchy, which initially comprised three provinces (Florence, Pisa and Siena), was divided into 242 communities which in turn were divided into a varying number of sections. The scale used for the maps varied from 1:1250 (inhabited centres) to 1:5000; the surface measurement unit was the *braccio quadro fiorentino*, whereas taxable income was 'expressed in counting currency (lira) and actual money (fiorino)' (MARTINELLI 1995:17). In order to use the same proportion across the entire territory, the community sections had to be divided – which usually corresponded to the ancient municipalities – in a varying number of map sheets. An Index Map was also created for each community, i.e. a relief on one sheet of the entire territory on a scale varying from 1:20000 to 1:30000.

The most important documents of the land register are: the Community Land Register Samples, the Guide Tables showing the owners and their respective properties, and the maps. The Community Samples are alphabetical registers reporting all the businesses registered in a community[3]. The Samples were double-entry registers. The parcels charged to the businesses or purchased after establishment were entered on the left (Debit), whereas the assets sold and purchased after establishment (Credit) were entered on the right. The Guide Tables, instead, progressively reported the number of parcels, land register sections, intended use and name of owners.

The establishment of the land register had involved a colossal amount of State technicians and officials. The measurement of the 3150 land register sections had produced 8000 original map sheets, an indefinite number of traces and a total of 1000 between guide notebooks and first and second notebooks of calculations.

A second very interesting archival source suggested by the vice-director of the *Archivo di Stato* (State Archive) of Pisa, Giovanna Tanti, is the archive produced during the plague of 1630 (TANTI: 1986). In the month of June, health inspectors from Florence informed the Commissioner of Pisa that news had been received of a number of Jews from Mantua and from other places that had been banished who could have fraudulently used stagecoaches so as not to be discovered and who could be a source of contagion.

Whether they were Jewish merchants or, as suggested by Tanti, simply messengers travelling between Pisa and Florence, in order to contain spreading of the contagion (confirmed in April on the northern border of the Gran Duchy and in August in Florence), "defensive measures" were also set up in Pisa to ward off the epidemic.

During the months following the message from Florence, a health magistrate was nominated, trade exchange was suspended, lazarettos were opened and guards were placed at the city gates. In a sort of forced isolation, Pisa prepared itself to receive the most undesired guest that promptly arrived in September: the bubonic plague. The disease was attested for the first time in via Santa Viviana (today, via Santa Bibbiana), where the parish priest, Father Battistini, reported the death of three people by contagion[4]. The quarantine was then quickly extended to all Pisa citizens; Tronci, in his memories, recalls how "the roads were barred" as also the houses[5]. Due to the forced confinement of the population (to hopefully contain the disease), the health office became responsible for monitoring the people in isolation. For this reason, a census was required of the entire population, house by house. Men, women, children and, in some cases, infants were counted to identify households "that cannot go to work [and for which] food must be bought for the whole family". This population survey, which included the infected persons in the lazarettos, in many cases provides information about the work carried out by the head of the family. These are very important data that were positioned with the GIS for the districts of Sant'Antonio and Maddalena, in the southern part of the city.

The published sources were mainly used for the recovery of historical cartography; the most significant cases were subsequently georeferenced and vectorised. As shown in the following paragraphs, this work was of crucial importance, for reconstructing place names, (re)positioning the households and working activities at the time of the plague, and also for calculating, although with a certain approximation, the evolution of urban space.

1.2 Immaterial Sources

The basis upon which the historical maps and alphanumerical information were positioned was the *Carta Tecnica Regionale* (Regional Technical Map - CTR) at a scale of 1:0000 of Regione Toscana. The 1:10000-scale CTR, comprises 715 tables called sections, whereas the 1:5000-scale map is formed of 2840 subtables called elements. These contiguous sheets are submultiples of the 1:50000-scale Map of Europe. Each table is identified by a six digit number. The first three numbers, between 001 and 652, indicate the 1:50000-scale sheet, the fourth and fifth digit, between 01 and 16, indicate the 1:10000-scale section and the sixth number, if other than 0, the element, which is between 1 and 4 of the 1:5000 scale. The CTR is distributed by the Region in paper and digital format (dxf, dwg, shp and raster). Errors are within three metres in planimetry and 1.8 in height. Level curves are 10 metres equidistant from each other[6].

The administrative vectorial levels, as well as the

3. The properties were often in the name of several persons (natural or legal), for this reason the land register refers to census businesses: 'the surname, name, patronymic and at times, titles and noble, knighthood, military and ecclesiastic ranking, or professional titles such as 'doctor or lawyer' are reported in the Samples for each business'. See (MARTINELLI 1995:13-25).

4. ASP, P. TRONCI, "Memorie in tempo di mal contagio", Manuscripts 8, c. 8.

5. ASP, P. TRONCI, Memories, p.18.

6. The regional law that established the regional mapping system is Regional Law 3/1983.

remaining cartography, obtained directly from the Geographical Information System of Pisa are linear shapefiles (level curves, water network and administrative limits), polygonal shapefiles (municipalities and provinces of Tuscany) and DWG files (vectorialisation on the CTR). The georeferencing scale used is 1:10000 (there are different formats: 1:2000, 1:5000, 1:10000, 1:25000 and 1:50000). This choice was influenced by the fact that Tuscan historical mapping is georeferenced at this scale. The system of coordinates used by the regional Geographical Information System for the production of its numerical cartography is the Gauss-Boaga projection, 1924 Hayford Ellipsoid and Datum Roma 40.

2. The work carried out

Georeferencing is an activity that assigns a specific system of geographical coordinates to an image (raster) which lacks spatial references7. Raster data, usually used in GIS environment, are generally of three kinds: topographic maps, aerial or satellite images and rasters from previously referenced vectorial data. In order to assign geographical coordinates to a raster file, the following may be used as reference basis: the values detected with GPS positioning systems, previously georeferenced digital maps or the information available on topographic maps, such as meridians and parallels8. In our case, the georeferencing solution chosen was to refer to previously referenced data. The layer target used – layer of reference – was the 1:10000-scale CTR (raster and vectorial format) of Regione Toscana9.

This technical procedure was carried out – in our case ArcGIS 10.0 software of ESRI was used – by entering pairs of Link points alternatively on the raster historical map and then on the administrative map. Once the Georeferencing toolbar was activated and the pairs of points were anchored using the Control Point command, the historical map was moved under the administrative map10. At least three pairs of points are needed to georeference an image – first-order polynomial transformation -, six for second order and a minimum of ten for third order.

The identification of relatable elements and the entry of control points require a certain deal of attention, especially when georeferencing maps that were produced during periods in which geodetic principles were not used, but only inaccurate flat measurements. In order to evaluate the real correspondence between the raster image being georeferenced and the layer target, the programme provides users with a Link Table tool. By clicking on the icon that activates this command, a table is opened containing all the pairs of anchoring points entered during georeferencing in their order of entry. In addition to providing the latitude and longitude of the points, the Root Mean Square (RMS) is also reported at the bottom of the last column11. Cancelling the points with the highest value of the last column (Residual) makes the RMS decrease and consequently reduce map deformation12.

Once the lowest possible error has been obtained using the Update Georeferencing command, the georeferencing information can be saved in an .aux file linked to the image being used. In our case, however, we believed it more appropriate to create a new file in tiff format in which the information was totally unconnected to the original file. After creating the new file with the rectify command, we used the Arc Catalog programme to transform these images into MrSID format in order to easily handle files that otherwise would have been very heavy13.

Since the *Leopoldino* maps were created using geodetic principles, the error is very low, whereas XVIII and XVII century historical maps (especially of the southern area of the city) have rather large margins of error. When georeferencing the images, this inaccuracy was corrected for the most part using rather high polynomial orders. Once the images were referenced, the various thematic queries in the historical maps were vectorised. These geographical databases are basically layers contained in the tables of information attributes which define the position in space and the alpha-numerical data of the historical documentation. As we will see further on, the geodatabases will be interrogated synchronically and diachronically in order to understand how and where the city was modified.

7. A raster is an image made of pixels. If a raster is made solely of images, each pixel corresponds to one value or attribute (grey-scale image), three attributes (RGB image: red, green and blue) or four attributes (CMYK image: cyan, magenta, yellow and black). When dealing with geographic rasters, in addition to the colour and tone attributes, the information of each pixel also contains special references and attributes for defining continuous surfaces – the depth of a layer or the density of a population.

8. The Global Positioning System was created by the US Ministry of Defence for military purposes and was subsequently used for civil purposes also.

9. The Regional Technical Map was created to provide updated local geographical data and for solely urban and land planning uses. The sheets (in an intermediate format compared to those of the Geographical Military Institute) have a scale of 1:50000, whereas the sections of 1:10000. This tool was developed by the regions and initially had specific planning purposes (hence the term 'technical'), but ultimately replaced tablets.

10. Polynomial transformation is the approximation between data and a polynomial plane (2D). http://www.ing.unitn.it/~zatelli/cartografia_numerica/slides/Interpolazione_spaziale.pdf [Access: December 2010].

11. Root Mean Square is a value that indicates the average absolute deviation in the two directions of space and is calculated on the basis of the polynomial order selected by the user.

12. The Residual error is equal to the difference between the point of the raster to be georeferenced and the layer target. This value, expressed in the measurement unit entered in the data frame, changes according to the selected polynomial.

13. See: http://forums.esri.com/Thread.asp?c=93&f=1740&t=137153 [Access: December 2010] for ArcGIS software procedures

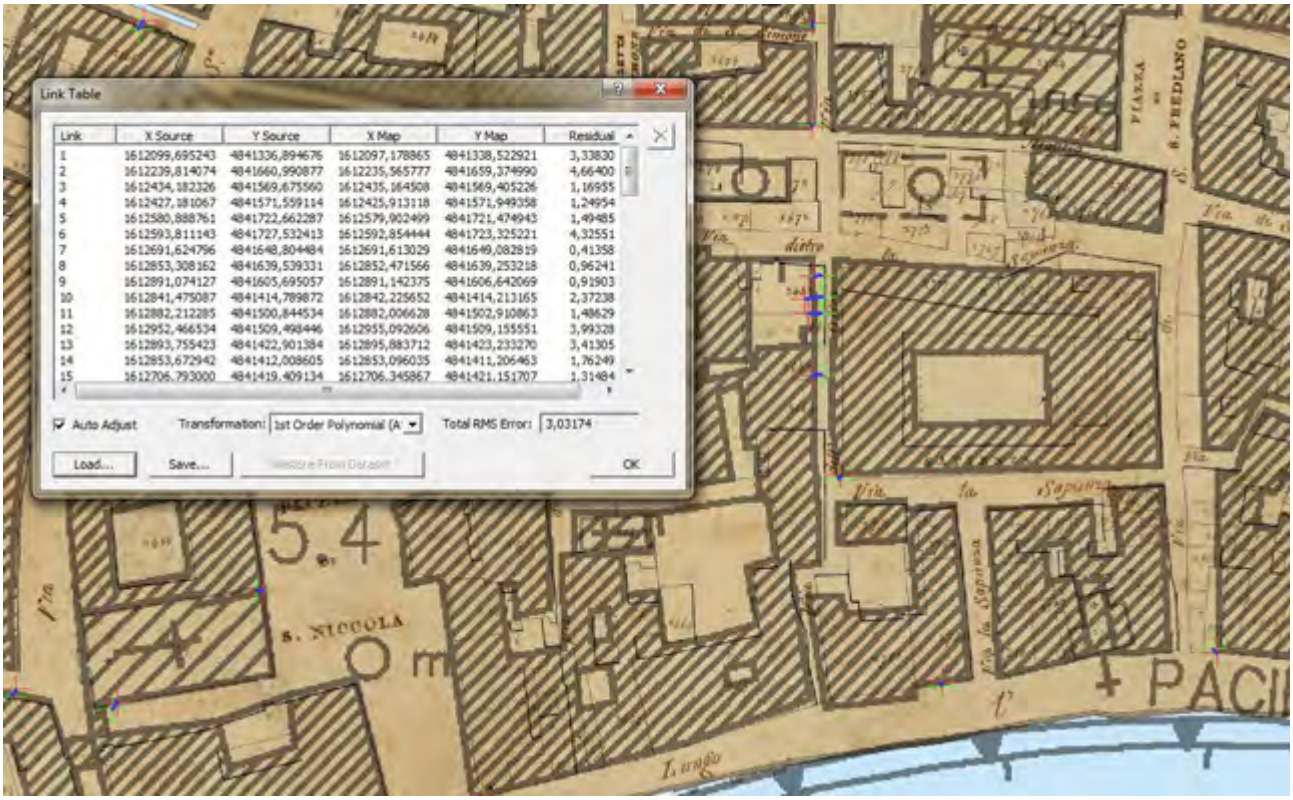

Figure 1. Control points entered for historical mapping referencing

3. The data collected

3.1 Toponymy

This paragraph analyses the toponymic data collected from the historical maps of Pisa.

Toponymy is a fundamental tool for acquiring knowledge of the local area; it witnesses the passage of men and natural events throughout the centuries. Toponymy is a synchronic activity which provides visible evidence of facts that have often been cancelled through time and reports what has taken place throughout the territory and has defined today's landscape. The diachronic study of place names is essential for any type of historical investigation involving the local territory. Our work mainly focused on studying poleonyms (the names of inhabited centres) and hodonyms (street names). Since our work focused on the Pisa urban fabric, the study of street names provided us with the greatest amount of information and revealed significant transformation.

For the area under examination, a total of 140 toponyms are registered in the CTR. However, considering only data inside the city walls, this number drops to 19; the *Leopoldino* map, instead, reports 404 toponyms of which 250 inside the city walls. The information provided in the *Leopoldino*, therefore, refers to street names which are not registered in the 1:10.000 CTR and which, instead, can be found in the current Land Register. Same sizes and shapes, but significant changes in the place names: this is probably attributable to the period subsequent to the Unity of Italy when a construction fever exploded in the city, as in many other Italian cities.

A further georeferenced information layer from which toponymic information was drawn is the Da Morrona map (reprinted from its original edition in 1787) which reveals very few toponyms: 60. The map, attached to the *Compendio di Pisa Illustrata* (Illustrated Outline of Pisa) written by *Da Morrona* himself, contains indications of the main roads and architectural elements of greatest significance; in some cases these references disappeared from later maps yet they are very useful for positioning the information found in XVII century registers, as we will see further on.

3.2 Urban space

Construction activities significantly increased within the city walls between the second half of XIX century and the years immediately after the Second World War. During this period, the green or lacustrine areas still present in the *Leopoldino* map were occupied. The section "C" of Pisa, located within the city walls, with its 3158 parcels represented 21.8% of the city's total parcelisation.

The built-up parcels in the area inside the walls

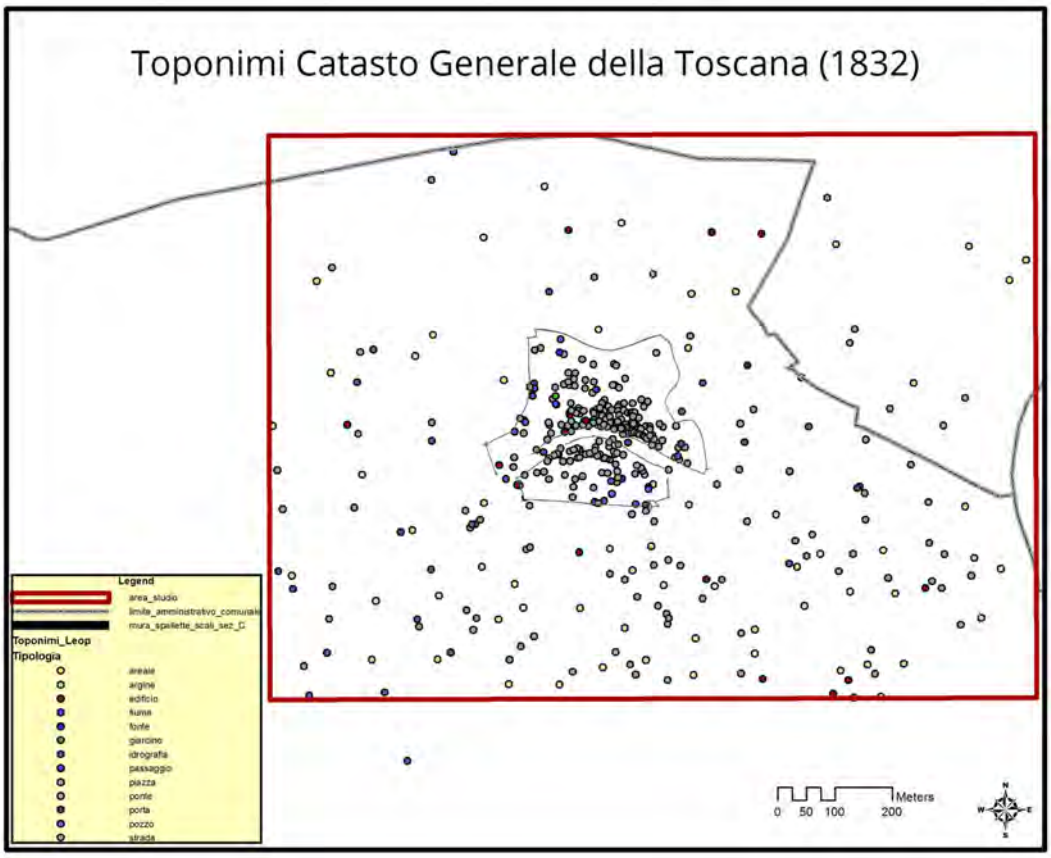

Figure 2. Toponyms extracted from the *Leopoldino.*

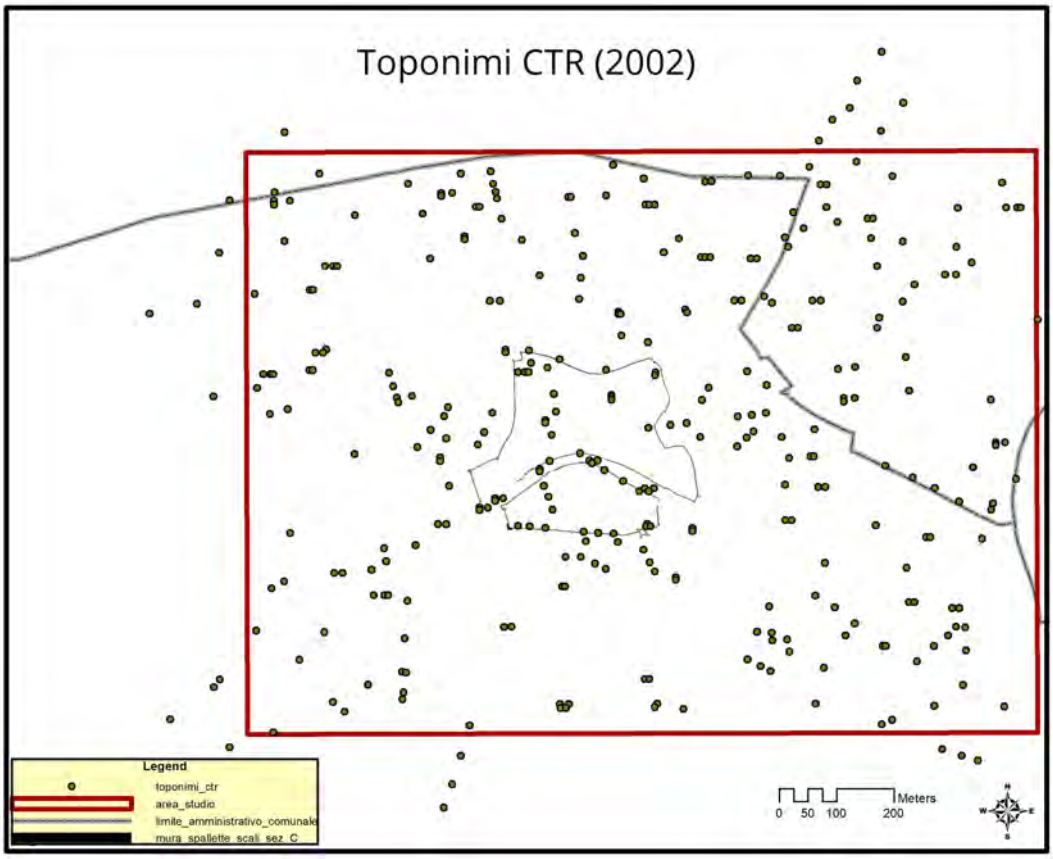

Figure 3. Toponyms present in the 1:10000-scale CTR (2002).

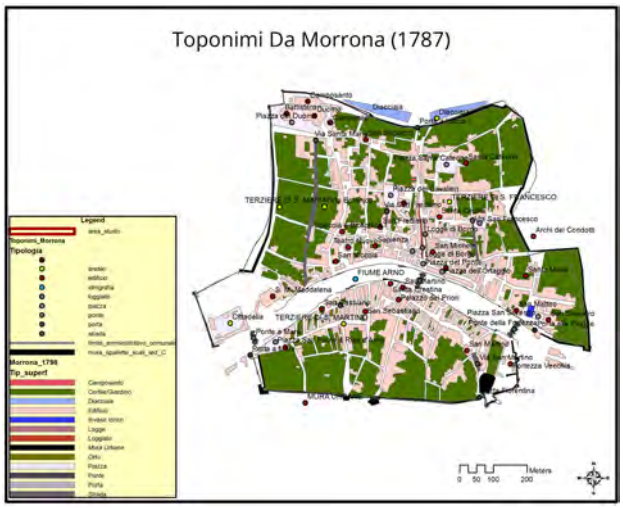

Figure 4 . Toponyms present in the *Da Morrona* Map (1787).

amounted to 2264. Of these, 664 were in the southern part of the city, whilst the remaining 70.6%, were north to the Arno river. The parcels registered as houses, buildings for trade and housing purposes and palaces were 1114; among the remaining parcels, indicated as houses with annexes (stables, ovens, enclosures, courtyards, vegetable gardens, gardens, etc.) of note are three farmhouses. The remaining 536 parcels were ecclesiastic and state buildings and various annexes mainly of a rural nature.

Overall, built-up surface upon establishment of the land register was 521,306.04 square metres. 15.8% of the built-up parcels belonged to nobles (358), 5.16% to the church (117) and 3.26% to the State (74). The value of these buildings, which were usually not parcelled, was higher than the other built-up parcels. In the northern part of the city, the nobles' properties were located along the *Lungarni*, in the area between Piazza dei Cavalieri and Piazza Santa Caterina, and also in the San Francesco district where the Court

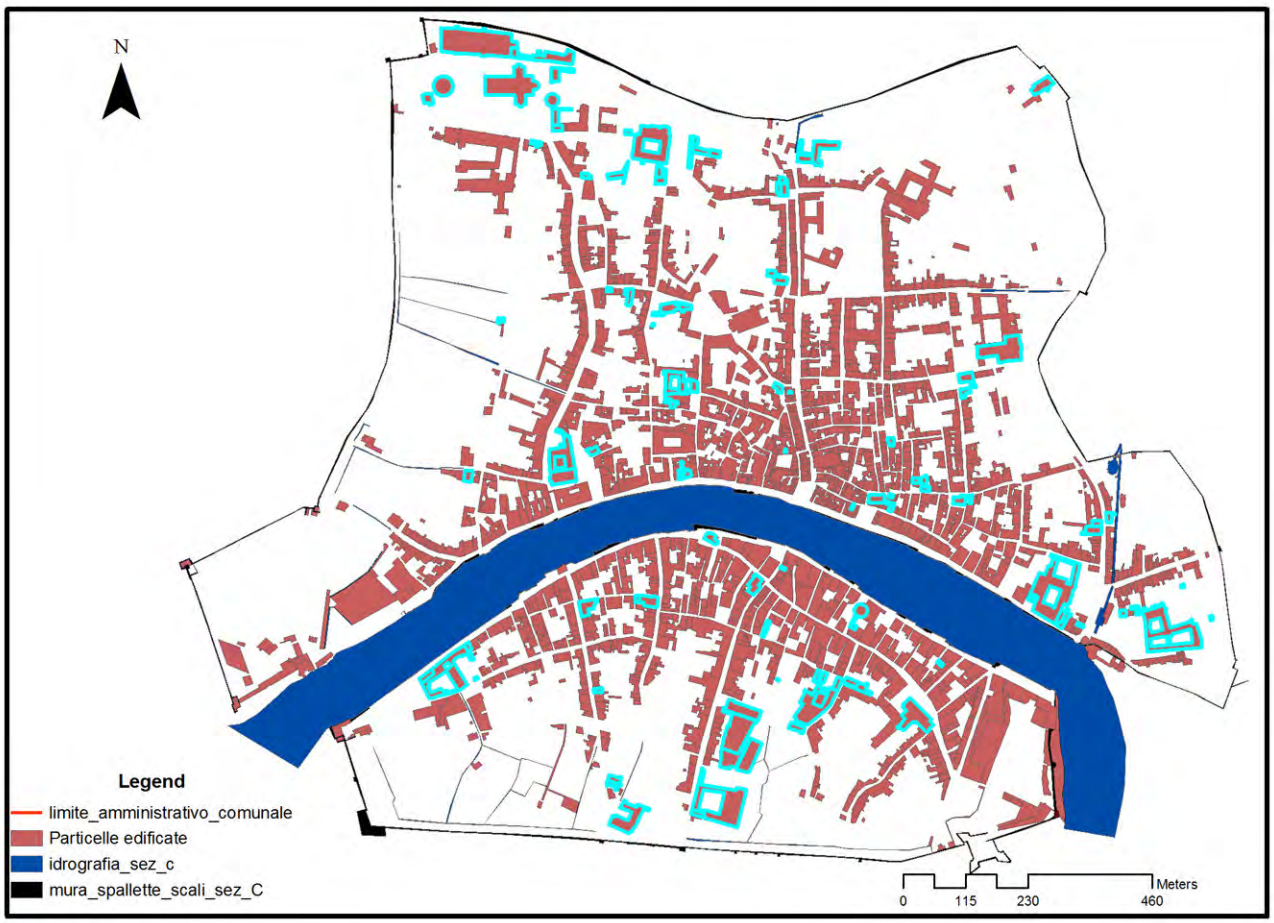

Figure 5. The properties owned by the Church upon establishment of the *Leopoldino* land register are highlighted in blue.

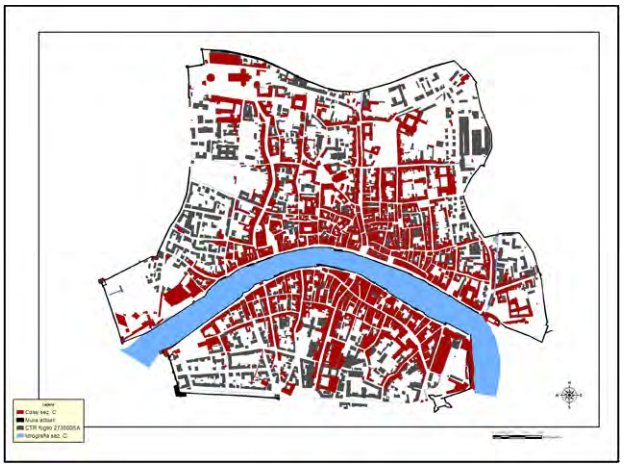

Figure 6. Overlapping of built-up parcels of the *Leopoldino* and CTR (2002) maps within the current city walls.

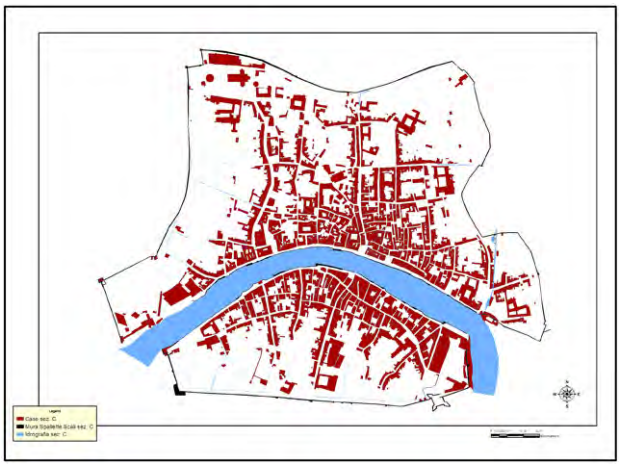

Figure 7. Built-up parcels upon establishment of the *Leopoldino* within the then city walls.

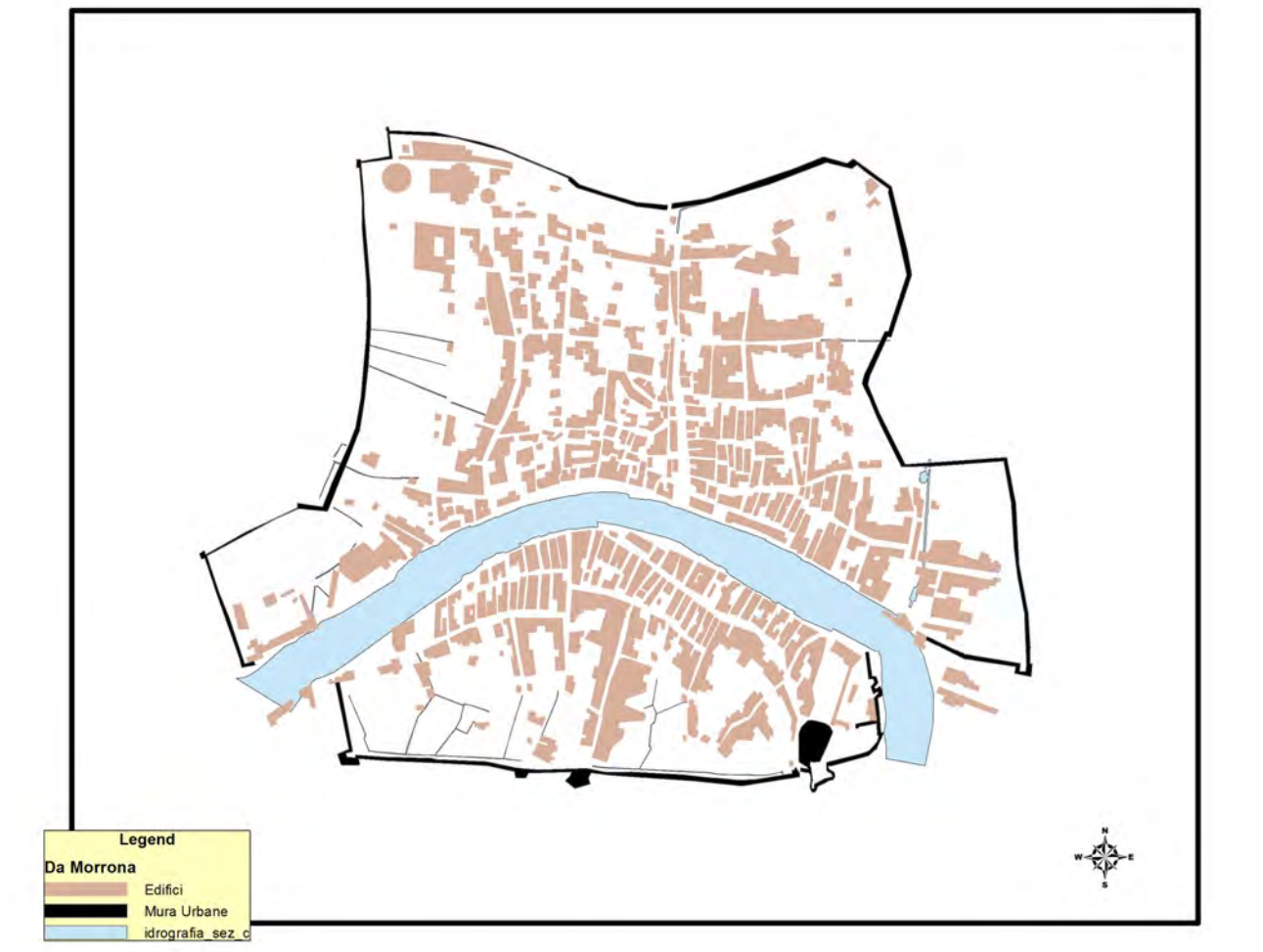

Figure 8. Built-up parcels present in the *Da Morrona* map within the city walls (1787).

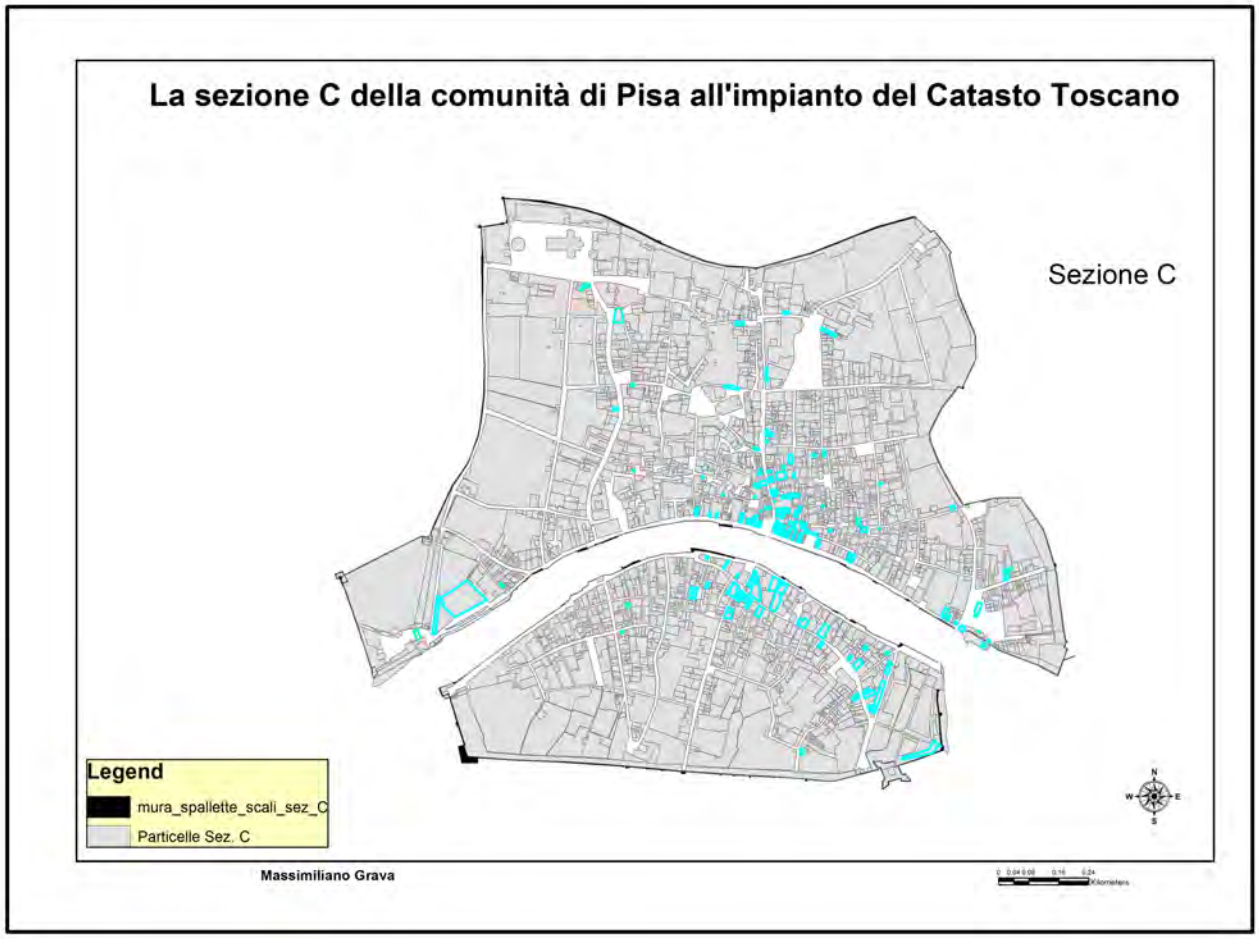

Figure 9 – The production activities present upon establishment of the *Leopoldino* are highlighted in blue.

House rises today; in the southern part of the city, the nobles' properties were located in San Martino and behind Palazzo Gambacorti, where the municipality is situated today (CACIACLI 1995:43-55). Ecclesiastic properties were evenly spread in both parts of the city, although they tended to be distributed in marginal areas with respect to the city centre, and in most cases consisted of monastic or worship buildings. The *Mensa Arcivescovile* practically had no properties, unlike the situation outside the city walls[14]. State properties: the *Arsenali Medicei* (Medicean Shipyards) area, Palazzo Reale, Piazza dei Cavalieri and Chiesa dei Cavalieri were located in the northern part of the city, whereas those situated to the south of the river rose near the Town Hall (BIAGIOLI 2003).

Regarding non-built urban areas, the majority were vegetable gardens (603 parcels), as well as land planted with vines (along the walls), grass and grazing land, gardens and lacustrine areas. Non-built lands belonged mainly to the lower social classes and these empty areas were built up during the subsequent construction phase (NUTI 1996).

The contemporary-age need to construct both housing and industrial buildings (foremost, the ex-Marzotto building that hosts the Computer Studies faculty and the Students' Secretariat of Pisa University) aggressively developed these areas leading to a 44.4% square-metre growth in these areas[15]. The arrival of the railway and the devastating effects of II World War bombardments, instead, led to the demolition of a great part of the city and of a large stretch of southern walls in the area where the railway station now rises.

The devastation caused to the historical centre of Pisa is also due to earthquakes (1846), disastrous architectural attempts to provide ample access to

14. The motu proprio of 6 April 1789 established that the assets belonging to the *Amministrazione delle Regie Possessioni* – also known as *Scrittoio delle possessioni* -, should be separated from the Sovereign's private assets, see. (Pult Quaglia 1980: 83-90).

15. At the date of establishment of the *Leopoldino* land register, the buildings (on the maps) occupied 521,306.6 square metres, whereas the built-up land – CTR (2002) – is currently 752,757.4 square metres.

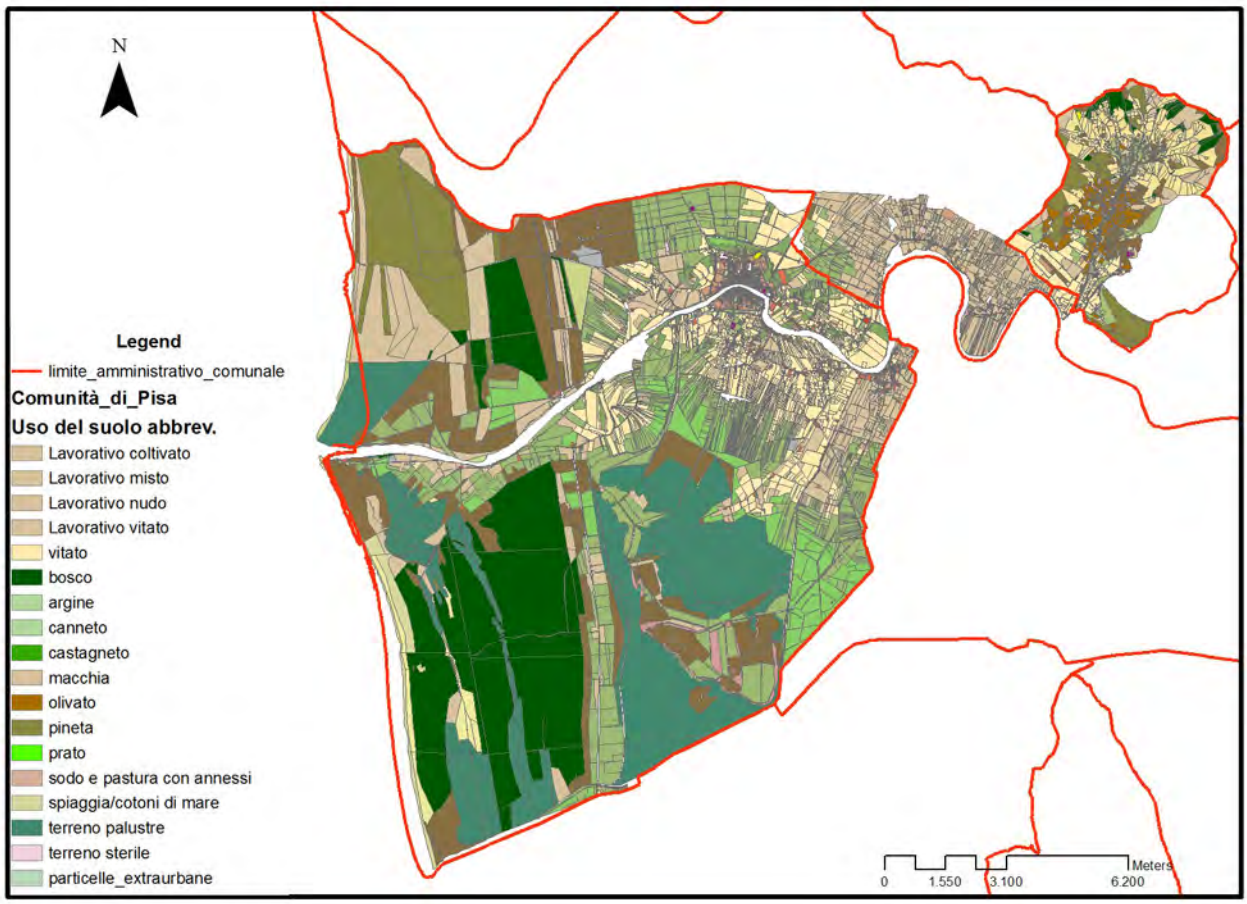

Figure 10. Vecotorised parcels of the entire community of Pisa

the centre which entailed the demolition of many buildings – the conversion of the San Francesco district –, and finally, the needs of the new-rising Public Administration – the Macelli (1906), expansion of Santa Chiara Hospital (1909) and the construction of the Court House (1935) – (LUPERINI, TOLAINI 1998:28-29; FRATTELLARI FISCHER, NUCARA DANI 1989).

After filling up all the free space in the city centre, Pisa began to expand in the immediate outskirts and then, during subsequent phases, in two directions: along the coast, where Marina di Pisa and Tirrenia were established, and then in more recent times, along the river Arno towards Florence (NUTI 1986:87-94). Figures reveal how significant this expansion was: the square metres of extra-urban buildings rose from 431,831.65 in 1835 to 4,976,095.23 in 2002, growing by eleven and a half times (+1152%) in just 167 years.

There is little surface variation between the *Leopoldino* (1832) and *Da Morrona* (1787) maps. The urban axes and the structure of the city districts appear to have settled. The built-up area, which is not divided into allotments on the map, is composed of 330 parcels, whereas non built-up space of 195. Two parcels with the toponym 'Diacciaia' located close to the northern external walls are worthy of note, as well as a number of churches such as Santa Appollonia which are not indicated in the general legend.

More detailed information is contained in XVII textual sources than in the maps belonging to the same period where there are gaps in the drawings. The buildings registered by the Health Office were analysed for the Sant'Antonio district, in the southern part of the city.

The census revealed that 292 buildings were present in 1631 of which 26 were unrented. Among these empty houses, 16 were infected, suspect or closed. A total of 1286 inhabitants were registered: 404 men, 533 women, 235 children and 34 infants. Owing to the quarantine, the Health Official estimated that 621 "needed food to be bought for them" and that no less than 226 individuals "could go to work". In many cases – 68.4% of the total amount – information about the work carried out by the head of the family is reported.

3.3 Production activities

Historical mapping vectorialisation does not provide any information (apart from the names of squares, roads and a few buildings) about the location of the production activities and trades carried out by the inhabitants. These data may be retrieved from tax sources, population censuses and business reports (the latter quite rare). The source used for this study was the *Leopoldino*, which contains maps, registers and the document drawn up by the Health Official in which buildings and families are detailed road by road. This very interesting study allowed us to examine the significant changes in the city's economic and urban organisation.

The working activities identified in the *Leopoldino* are: shops (154), warehouses (60), mills (2), wax factory (1), print shop (1), inn (1), coral factory (1) and bakery (1). These activities were mainly located in the southern district of San Martino – Kinzica –, and to the north close to Ponte di Mezzo, along via di Borgo and via degli Orafi (Tolaini 1992:17). The area in which production activities are practically missing in the *Leopoldino* is the southern district of Sant'Antonio, an area with few buildings and much working land, partly lacustrine.

We believed it would be particularly interesting to examine this area in the XVII century sources to understand the reasons for the low number of shops and factories. To our great surprise, the Health Office registers reported a large number of residents and trades. The households for which information is provided about the work carried out by the head of the family include: 26 tanners, 23 boatmen, 22 carriers, 8 fruit and vegetable vendors, 7 cobblers, 6 bakers, 6 woodcutters, 5 tailors, 4 bricklayers, 4 delicatessen merchants, as well as 1 cheese maker, 3 roof coverers and around 10 people working for the Customs. The prohibition of the public health authorities to carry out tanning activities in inhabited areas (XVIII century), and the construction of the bridge exactly in that area of the city caused the activities of both tanners and boatmen to disappear, causing strong economic loss in this area. These two factors were the reason for the low number of trades in the *Leopoldino* map. Since the most important trades had disappeared, this led the people working in ancillary activities (carriers) and many retail sale activities to migrate.

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