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## The cartographic collection of the State Archive of Rome online Archival issues and digital models

*Keywords:* historical map, State Archive of Rome, digital libraries, multilevel description; JPEG 2000

*Summary:* the State Archive of Rome hosts a very relevant cartographic heritage, produced by architects, engineers and technicians at the service of the Papal State or for individuals. Many of these maps and drawings are together in large map collections, but many others are still in their archival context.

The paper describes the story and structure of these series, the areas of interest of the Collection, focusing on waterworks maps and the role of cartography in the birth of hydraulics disciplines.

A second part of the paper deals with the new finding aid of the “Collezione I” and the work that was made to migrate new descriptions on an online digital library service, analyzing both by the content and the technical point of view.

### Cataloguing maps

A long time ago, in the '80, the possibilities of information technology pushed many professionals of historical cartography to outline ambitious projects of databases concerning cartographic heritage. As everything was new at the time, and the technology opportunities seemed to have no limits, the records conceived reflected the ambition of a «monstre» description of several pages, actually an interdisciplinary monograph unfit to the real situation of Italian archives and libraries. Time went by and some years ago, in Italy, a group of archivist, librarians, museum and cartographic institution keepers agreed with a document that defined a small set of essential elements to describe a map, wherever it was<sup>1</sup>. It was an important step ahead to the possibility of working together, because it made all our minds free from the obsession of defining an “archival way” or a “librarian way” to describe a map, and moreover introduced an element that was never considered before, i.e. geo-referencing. In the past only geo and topographic names provided geographic elements of description, maybe stored in a controlled vocabulary; as we know today, geo-referencing is a powerful tool to link all possible description of any possible hierarchy to a defined place of the earth surface. Of course, a real geo-referencing is not possible for pre-geodetic maps, but it is usually possible to locate the main place/places of an ancient map using geographic coordinates.

Another key element of interoperability in maps description is “authorship”. This is in my mind the only way to put aside the discussion around an “archival way” (based on the document context), or a “librarian way” (based on the content), to describe a map. By the archival point of view, a map is not an “archival unit”, but a document contained in it – and actually the international ISAD(G) standard for archival description do not deal specifically with maps<sup>2</sup>.

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<sup>1</sup> *Linee guida per la digitalizzazione del materiale cartografico* ICCU:

[http://www.iccu.sbn.it/upload/documenti/linee\\_guida\\_digit\\_cartografia\\_05\\_2006.pdf](http://www.iccu.sbn.it/upload/documenti/linee_guida_digit_cartografia_05_2006.pdf)

<sup>2</sup> ISAD(G), Introduction, I.4: “This standard contains general rules for archival description that may be applied irrespective of the form or medium of the archival material. The rules contained in this standard do not give guidance on the description of special materials such as seals, sound recordings, or maps. Manuals setting out

Now, what makes a map different from an administrative document as we usually have in the archives? Both are product of an intellectual work, but making a map is typical of a specific profession, or a specific “art” as was used to say in the Renaissance, when a map was made according to the “rules of the art”. This is what we call today “authorship”: an intellectual activity that involves both the respect of a set of rules and a creative component. We may say that a painting, a building, a novel, a photograph or a map has an “author”, an administrative document has only a “producer”: let it be said respect to the cultural colonization of the cultural heritage by the librarians who only conceive an “author” and by archivists who only conceive a “producer”. In consequence of that, the archivists accepted from the beginning to consider the finding aid to describe the collection as a normal “catalogue” of maps: which makes our work on the cartographic collection in the State Archive of Rome interoperable and useful to anyone.

### Maps in the State Archive of Rome

In our archive, we have three typologies of cartographic documents:

1. Maps produced at their origins as cartographic series, eventually connected to a series of registers: it is the case of the “forest” of about 4 thousand cadastral big roll maps, traditionally stored in vertical under the roof of the ancient Sapienza building, that we are now storing in new racks and compact shelves in horizontal.
2. Original cartographic series, which maintain their identity also if included in the general collection of maps: some ancient finding aids allow us to identify these groups for sure as part of the original archives.

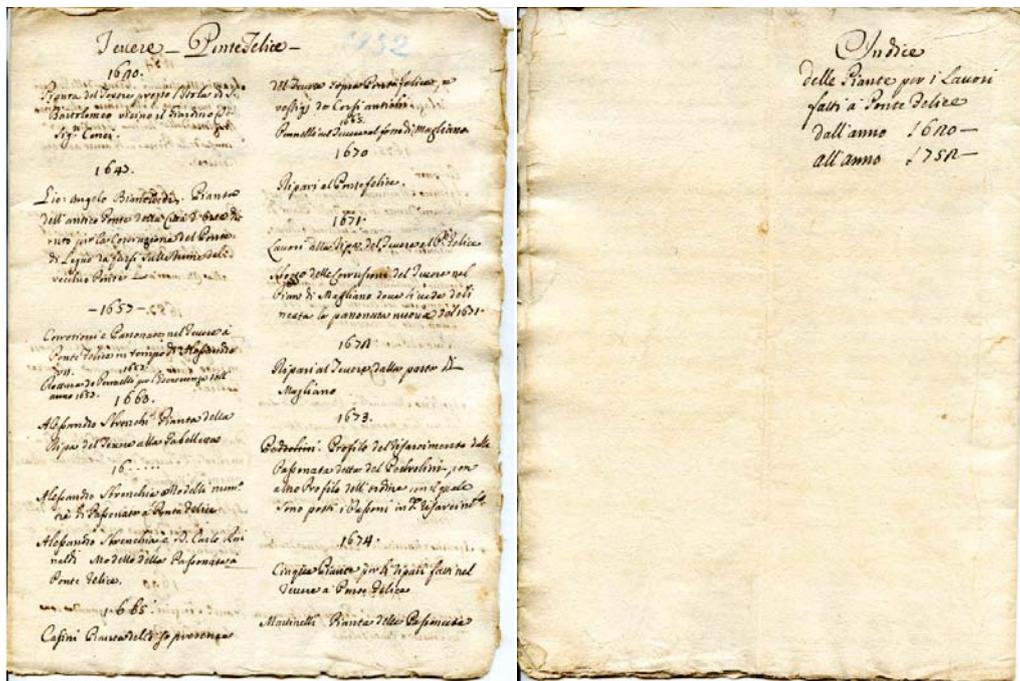


Figure 1: the original catalogue of maps about waterworks on Tiber river at Ponte Felice, made by the architect Antonio Felice Facci in 1752 for the Congregazione delle acque.

descriptive rules for such materials already exist. This standard should be used in conjunction with these manuals to enable appropriate description of special materials” – available at <https://www.ica.org/en/isadg-general-international-standard-archival-description-second-edition>

3. Single items in a collection, sometime grouped in an “archival unit” according to a specific affair. Their “archival bond” with the original fond is often lost, although some writings on the back, or our own knowledge of the subject allows to identify the origin of the single map.

To go deeper in just one of the main areas of interest of this map collection, I will focus on maps concerning waterworks<sup>3</sup>. This category of maps has a very ancient origin, as it was created to demonstrate the property of lands along the rivers, specifically the Tiber river, where the monks of the San Pietro di Perugia abbey developed specific geometrical technics of design, that the famous jurists Bartolo describes in his *Tractatus de fluminibus*<sup>4</sup>.

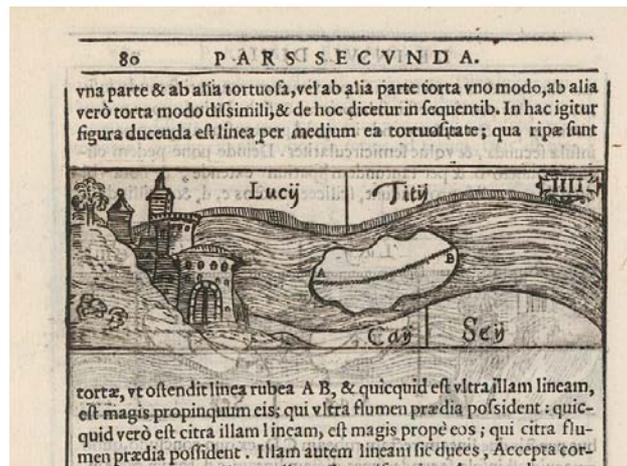


Figure 2: Bartolo da Sassoferrato, *Tractatus de fluminibus*.

This tradition is so relevant that Giulio Danti, the father of the most important painter cartographer of XVIth century in Italy Ignazio Danti, learned the art of landscape design in his own family in Perugia, and wrote his own treatise about floods<sup>5</sup>. By the way, their original family name was Rainaldi, so no wonder if a few time later the famous architect Domenico Fontana hires for of his expertise in design the young Girolamo Rainaldi<sup>6</sup>, who signs a beautiful map concerning the borders agreement in between the Pope and the Granducato of Tuscany<sup>7</sup>.

<sup>3</sup> P. Buonora, *Fiumi di carta*, in D. Sinisi (edited by), *Luoghi ritrovati : la Collezione I. di disegni e mappe dell'Archivio di Stato di Roma (secoli 16.-19.) Inventario*, Archivio di Stato di Roma, Roma, 2014.

<sup>4</sup> Bartolo da Sassoferrato, *Tractatus de fluminibus seu Tyberiadis*, Bologna 1576.

<sup>5</sup> *Archivio biografico italiano*, cit., *ad vocem*.

<sup>6</sup> *Archivio biografico italiano*, cit., *ad vocem*. Souces used are: G. B. Passeri, *Vite de' pittori, scultori e architetti che hanno lavorato in Roma*, Roma 1772, p. 216; F. De Boni, *Biografia degli artisti*, Venezia 1840, p. 78.

<sup>7</sup> Carlo Maderno, Girolamo Rainaldi, *Pianta del Concordato coi toscani sulle Chiane*, 1605 (Archivio di Stato di Roma, Collezione I disegni e piante, cart. 17, foglio 173).

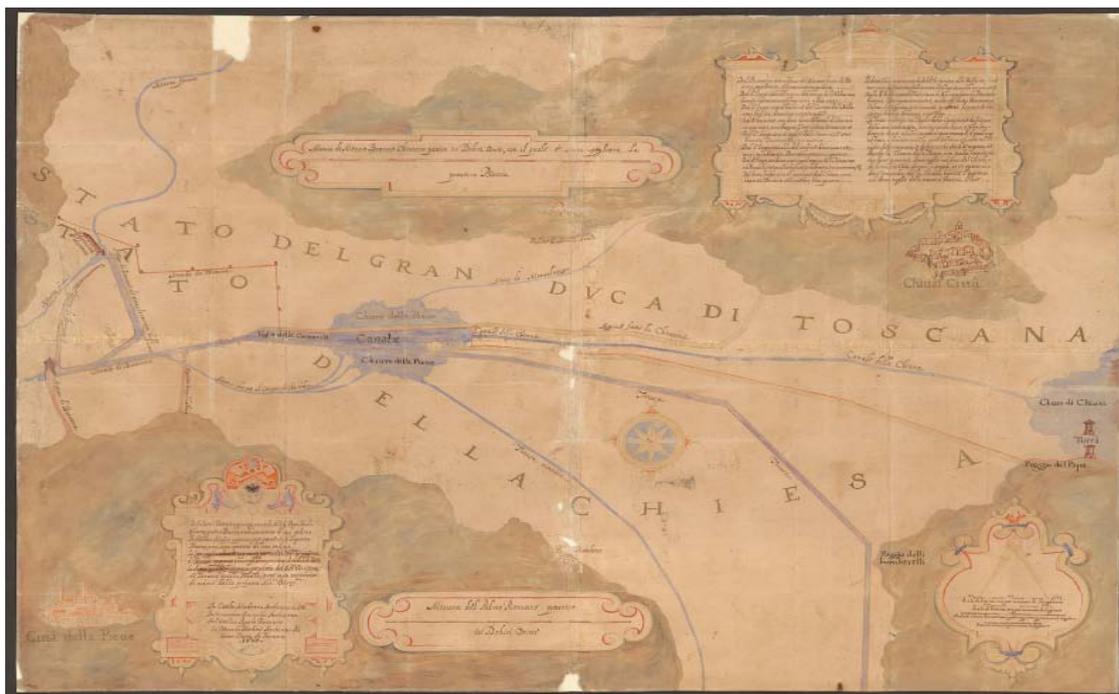


Figure 3: Carlo Maderno, Girolamo Rainaldi, Pianta del Concordato coi toscani sulle Chiane, 1605.

These ancient origins of waterworks maps gave a crucial support to the development of hydraulics as a practice of expert professionals, and sometime after as a science based on mathematics: in our archive, there are maps directly connected to the studies of the disciple of Galileo Benedetto Castelli about the lake Trasimeno. Even more than that, there are a large amount of maps about the marsh in between the cities of Bologna and Ferrara<sup>8</sup>, where the exceptional cartographic production went side by side along two centuries with the growth of awareness of the rivers and canals hydraulic behaviour.

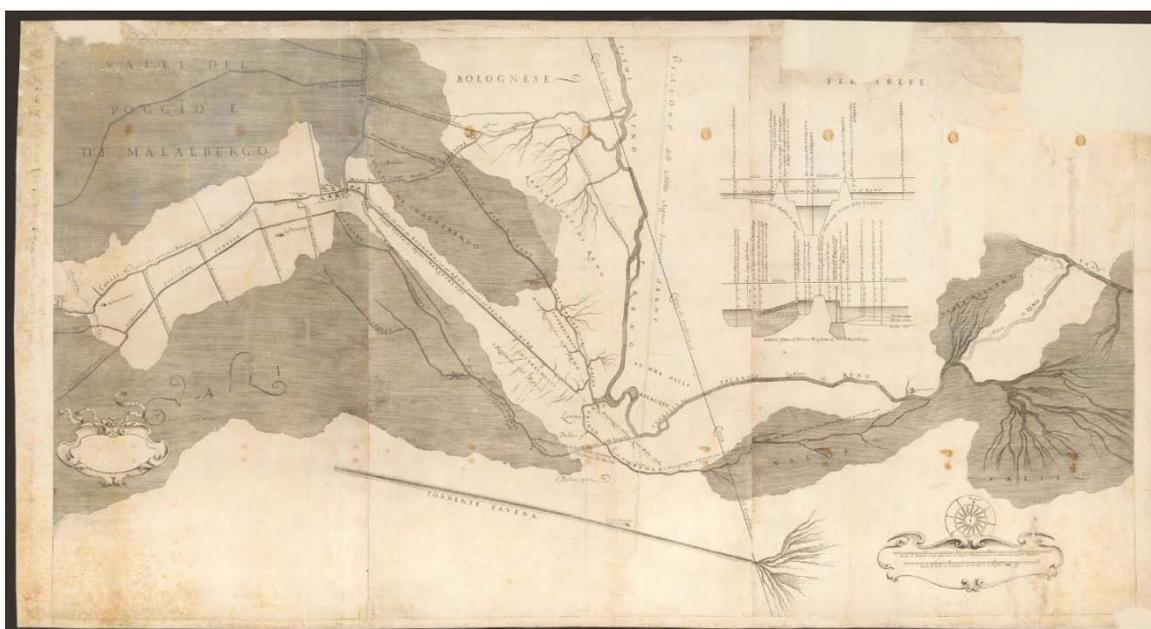


Figure 4: Map of the marshes between Bologna and Ferrara, 1799.

<sup>8</sup> Map of the marshes, graved at the end of XVIIIth century, based on the surveys made from 1609 to 1799, (Archivio di Stato di Roma, Collezione I disegni e piante, cart. 65, foglio 363).

Finally, sometimes these ancient river maps gives us a unique evidence of the original landscape in central Italy, which changed completely in the contemporary period after WW2: it is worthwhile to mention that in our Constitution, article 9, the landscape is considered an heritage to preserve, as well as the artistic and historical heritage.

This is just to highlight the relevance of our cartographic main collection, or “Collezione I dei disegni e piante: it includes about 8.500 drawings and maps, concerning towns, buildings, ports, roads, rivers and aqueducts, mills, real estates, woods, some technical designs, collected from many fonds of the State Archive of Rome. It is necessary to stress that our archive is one of the most important in Italy, not only according to the relevance of the Eternal City, but also because it hosts the papers of all the Pontifical State from his origins to the end in 1870, and after the papers of the administrative offices of the province of Rome.

### A new finding aid, a new web service

The drawings and maps were from the origins of the Collection grouped by place, in an alphabetic order, and my colleague Daniela Sinisi, who worked to a new finding aid for many years and with several contributors, kept this order when she published it as a database in a CD, together with a book describing the Collection itself<sup>9</sup>. The new descriptions provide for each item original titles and content descriptions, authors names, drawing technics, measures, specific dates and many notes that may help to retrieve the archival origins of the item.

The basic problem of the database produced on CD was that technology always go ahead in a very few years, and the application was hardly working on the operating systems used now. Moreover, the data model was “flat”, so in the case of an archival unit grouping several elements, each field of the record grouped descriptions and data concerning the whole group: the only way to separate data was a prefix number identifying single items.

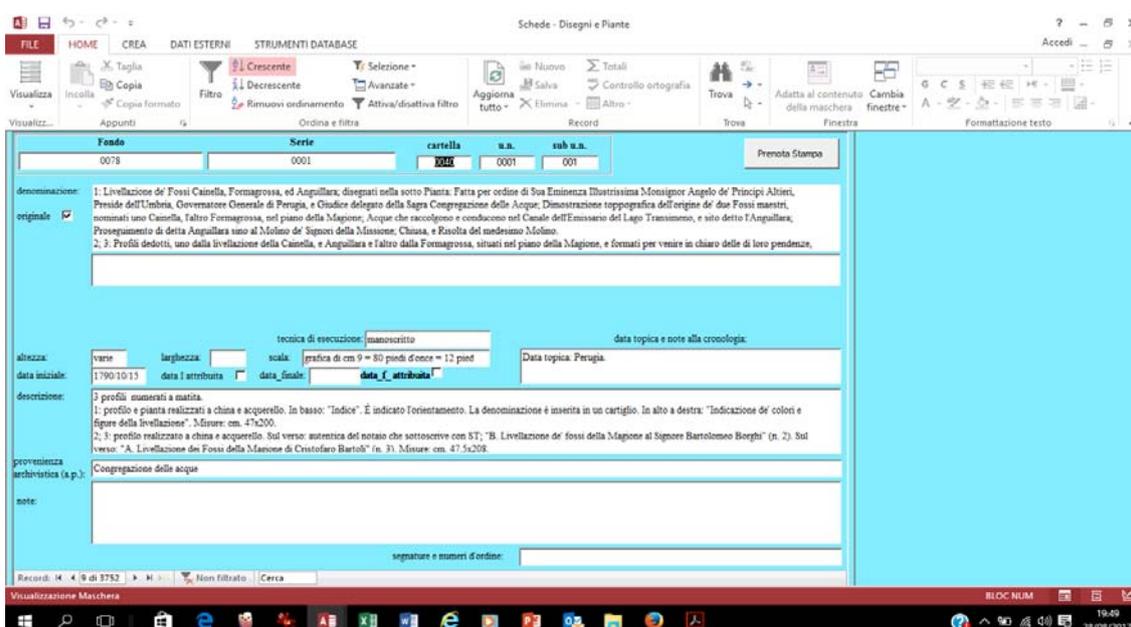


Figure 5: the new finding aid of the Collection I in the original CD application.

<sup>9</sup> D. Sinisi (edited by), *Luoghi ritrovati*.

This is a very common case in the works conceived some years ago: archivists and librarians were not used to think in a one-to-many entity-relationship model of data and adopted or required to IT technicians a simple “flat” filing schema.

A lot of work was done to extract personal and place names from the record, providing two indexes qualifying each entry with attributes to better define his meaning; but the indexes did not worked really in the CD application. Moreover, now database tools allows to retrieve any possible name (as a text substring) in the records without needing to compile an index.

Finally, maintaining the original order of the items was not acceptable without a clear geographic classification, as the list of place names/subject entries had no standard at all. Sometimes, as in big cities like Rome, there was a sub-sequence of subjects (walls, aqueducts, churches, ...), but the original classifying schema was lost, or hardly understandable by the content of the items.

The only way to make all this long work available to the users was to achieve the following goals:

1. redesign the data model in a two level description, splitting the original record fields and distributing information in the child-level records;
2. identify in a better way the ancient place names, making them meaningful to the user, and making evident the original classification;
3. implement an online application, based on a client-server environment, and on an open source SQL standard database.

It took about six months to achieve point 1 and 2, and some more time to publish the new digital library service in the context of our Imago II project.

Of course, splitting 3.700 original records in 8.500 child-level records was not easy nor fast, as there are always some operations, which is not possible to automate: the strategy must be to limit as possible the cases where you have to operate on a single record. Anyway, most of the main (father-level) records (2.396) had one only secondary item, 977 records had 2-3-4 secondary items, and just a few cases more than 20.

Re-define place names was not an easy work as well, and I think it was possible to do for any single item only because of the help of Google Map service. It is quite clear that the ancient archivists had just classified the maps taken from the fonds writing a place name, right or wrong it was, no care if it was meaningless out of the archival contex. Consider that after the birth of the Italian Kingdom, when several ancient regime countries were unified in one, many villages and towns had to change their name, because the same name was used in other regions. To make an example, in the old finding aid of the Collection there was “Anticoli di Campagna”, that became well known after 1911 as Fiuggi (Frosinone province) for his thermal sources. In other cases there were simply mistakes, or different ways to tell a place name: “Gugliano” was actually “Agugliano”, Ancona province. In most cases, a standardization of place name presentation was done, defining the communal territory for less relevant places: “Bassanello, nel comune di Gallese (Viterbo province)”.

This work became exciting in the few cases where the original place name were absolutely anonymous and meaningless. Also in these cases the research was successful thanks to unexpected possible strategies, as comparing the shape of a castle plan with Google map images, or considering the natural context of a property, or even investigating on the local name of a fish, that the cartographer used for naming a country street.

When finally any item was “at his own place”, we started to work at the online application with the help of an IT professional. In the interface the user has a menu on the left side providing the original string/sequence of the Collection I, which must never change because it was used for

many years as a footnote reference; now this sequence is more clear at the top of the main record, thanks to the work we made on place names:

*Place:* Agugliano (AN), mulini

*Old classification:* Gugliano

The user has 4 research options, if he do not knows the folder/sheet number:

1. an alphabetic menu containing the new classification by place/subject

.....
Ravenna, strade
Ravenna, territorio
Recanati (MC), edifici
Recanati (MC), territorio
Reno, fiume
Rieti, acque
Rieti, strade
Rimini, antichità
Rocca di Papa (Roma), territorio
Rocca Priora (Roma), palazzi
Roma, carceri
Roma, caserme
.....

2. an alphabetic menu containing the toponyms list made by the author of the new finding aid, Daniela Sinisi;
3. an alphabetic menu containing the personal names, with a definition of their role (always by Sinisi);

...	...
Agnusdei Terenziano	notaio
Agosta, comunità	proprietaria
Agostini Romaldina	proprietaria
Agostiniani di Formello, monaci	proprietari
Agostiniani di Lombardia , congregazione	proprietaria
Agostiniani di Polverigi, monaci	proprietari
Alatri, comunità	proprietaria
Albacina, castellani	proprietari
Albani Alessandro	cardinale
Albani Alessandro, monsignore	prefetto della Congregazione delle acque
...	...

4. a two box free text search on all the descriptive fields, both of the main and secondary level.

The screenshot shows the 'Archivio di Stato di Roma - Proj X' browser window. The URL is 'www.cfr.beniculturali.it/Collezione\_I/collezione\_I.html'. The page title is 'IMAGO' and the subtitle is 'Disegni e Pianta - Collezione I'. The navigation menu includes 'Home Imago', 'Serie Imago', and 'Disegni e Pianta - Collezione I'. The search results are displayed in a table with columns for 'Numero', 'Intestazione', 'Descrizione', 'Misure', and 'Immagine'. The first result is for 'mulino' and 'molino' in Umbria, Maroggia dal Ponte di Azzano sino al Ponte e molini di Magnolo (sul verso).

Numero	Intestazione	Descrizione	Misure	Immagine
1	Umbria, Maroggia dal Ponte di Azzano sino al Ponte e molini di Magnolo (sul verso).	Pianta realizzata a china. È indicato l'orientamento. Sono presenti rappresentazioni in abito del molino, del ponte di Azzano e del molino di Magnolo. Sul verso: "Umbria, Maroggia dal ponte di Azzano sino al ponte e molini di Magnolo"; "Maroggia", "IV" 3".	cm. 43,5x57,7	

Figura 6: results of a query made on two regional variant of the Italian name for "mill", i.e. "molino" and "mulino".

When a digital copy of the item (at the secondary level) is available, the box "image" shows a preview of it, or sometime, if the item relate to several images – as it happens for a multi-pages report, or a recto/verso of the original the box shows all the previews of the images available. It must be said that digitizing the whole Collection I, and the others cartographic collections is a never-ending work, or, to be positive, a constant work-in-progress activity of our institution. Consider that a complete digitization of Collections I to III would take more than 12 thousands shots: we had a B/W complete microfilm of these collections since many years, but it clearly unfit to provide an acceptable digital surrogate of the original to the user.

In addition to the traditional map collections, we see that a new collection is growing in our archive year by year, because of conservative issues. As maps are precious, or because they come back from a restoration work in a plain feature and we cannot folded up any more in the old registers, we place them in a new storage, which means that we do create a new collection. To manage such a trend, the only thing to do is scanning at high resolution all these new items, integrate our map collection database with these items and link the records someway to the provenance fond.

Nevertheless, we just had many excellent high-resolution digital images that we made in the last 10 years, and this was the best opportunity both to provide a new up-to-date service to the users of our digital library Imago II, and both to give a framework to the daily or extra activities of our photographic service. Now all the work of the photographic service on maps is standardized and stored in a systematic way on our image server, with safe backup procedures. At the moment we can provide online 2.435 high resolution image files, stored in the JPEG 2000 format that we consider the right choice both for the quality of the images and for their preservation in time<sup>10</sup>.

We took the opportunity, implementing the new page devoted to the map collection, to make an important technical change, which was in the air since some time. We have been using for years

<sup>10</sup> See P. Buonora – F. Liberati, *A Format for Digital Preservation of Images*, in D-Lib Magazine July/August 2008, Volume 14 Number 7/8: <http://www.dlib.org/dlib/july08/buonora/07buonora.html>

an excellent image server product by Lizardtech, which worked very well with our JPEG 2000 imagery: but nowadays the spread of open source product made apparently the maintenance of the software less rentable, and became more and more hard to find upgraded versions of the plugins to work with the recent release of browsers. On the other hand, open source world made a relevant progress in these years, and now it is possible to provide a good service online without the need for the user to install and upgrade in time a plugin, working as well in Windows, as in Apple and Android world.

The new image server we adopted is IIP Image, but we had some problems with the JPEG 2000 format, because to provide good performances with very big images – as we have – it is necessary to integrate it with the proprietary Kadadu library to operate the compression/decompression work. The commercial problem is that Kadadu company<sup>11</sup> - in our limited experience - does not really have a commercial policy to individuals or institutions to make them choose direct purchase of a license, and it is cheaper to buy a final product that integrate IIP Image powered with Kadadu library. Now a new IIIF Server by Klokan Technologies, in the IIPMooViewer configuration, is working on a Linux server to release all the zoomable images of our digital library Imago II.

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<sup>11</sup> <http://kakadusoftware.com>