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Baden-Württemberg State Archives as Custodians of Maps and Georeferenced Data. Towards a Digital Archival Infrastructure for Cartographic Records

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Summary: The paper deals with the question how the Baden-Württemberg State Archives provide access to their cartographic and geographic records. It outlines what a digital archive infrastructure for the access to these records should look like in the future and points out steps that the State Archives have taken towards such an infrastructure. A crowdsourcing project had an important role to play in this process.

Introduction

The Baden-Württemberg State Archives (Landesarchiv Baden-Württemberg) have the task to preserve records of lasting value for the culture and history of Baden-Württemberg, to provide access to them, and to promote them to the interested public and research community. These records, which are organized in fonds, include a huge amount of cartographic material. Today, the Baden-Württemberg State Archives alone hold more than 350,000 maps, plans and architectural drawings in seven archive departments. In addition, more than 160 kilometers of historical and current land register documents are kept in a separate branch office (Seidu 2019: 29).

The reason why so many cartographic records found their way to the State Archives can be traced back to the importance of geographical information for the administration in general. Hardly any government branch can work without spatial information. This has not only resulted in numbers, but also in different designs and manifestations, because maps assumed different functions in specific administrative workflows. Forest maps, for example, record the rights to forest areas, boundary maps were used in political conflicts to substantiate one’s own claims, cadastral and land register documents depict ownership and fiscal obligations, whereas strategic maps and plans serve military purposes (Figures 1 and 2). With the technical possibilities, the manifestations have developed even further. Originally, maps were hand-drawn or printed, but from the end of the 19th century, aerial photography and remote sensing from space complemented the traditional concept of maps (Figure 1). Since the late 1990s, the Baden-Württemberg surveying authorities have worked almost exclusively with digital geographical information.

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1 I would like to thank my colleagues Daniel Fähle, Kai Naumann and Andreas Neuburger at the Baden-Württemberg State Archives for their useful comments and suggestions.
2 Cf. also Kreucher (2016: 4-10).
Regardless of whether analogue or digital, after maps and plans have served their original purpose, many are transferred to archives. The Baden-Württemberg State Archives acquire them from state agencies together with other records as the result of an evaluation procedure called appraisal. A smaller part of the archival fonds comes from private sources, and is collected as a supplement.

Figure 1: LABW, HStA Stuttgart, N 5 Nr. 38: Several aerial photographs glued together showing the airport of Böblingen

Access today

For the Baden-Württemberg State Archives, the most important way of providing access to cartographical records nowadays is still to make them available in the reading rooms that are located in each archival department. There, every user can request archival records for viewing, reading and examination, provided it is legally permitted. However, before users can request and access the maps and plans they are interested in, they must first be able to find them, which in turn requires an archivist having described the material beforehand. In archival practice, some more or less strictly implemented procedures have developed to provide for this, based on the more general standard for archival description ISAD-G.\(^6\) The guidelines cannot be presented here, but it should be noted that the description of the context in which the maps and plans appear plays a much greater role than in the cataloging standards of libraries.

A first step towards the improvement of the access to archival fonds is the transformation of analogue archival descriptions into a digital format. Most commonly, an EAD XML-schema is used for this

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purpose in the archival community (Janes 2012). Once the transformation from analogue to digital information has been completed, the user can access it online, in case of the State Archives via its online finding aids system (OLF). The interface not only displays the textual description of all archival units as well as essays on the history of the records. It also maps the structure of the archival fonds so that the context of the respective fonds is retained. Users can browse or search to find out whether maps and plans are available and order them into the reading room or as digital copies. The next step towards better access is the proactive digitization of maps and plans by the State Archives. In addition to the online finding aids system, the State Archives provide a separate module for digital representations (BildCMS). Users can view the documents there, but also download them. This saves users the effort of travelling to the archive, preserves the fragile originals and opens up completely new possibilities, like georeferencing. The State Archives have already processed a considerable number of such records, but there is undoubtedly still a lot of work to be done before all maps and plans are available online.

Another issue that will grow in importance is the access to digital-born data, which are permanently, securely and authentically stored in a repository called DIMAG (Keitel 2015). Alongside audio and video recordings, e-mails and databases, DIMAG contains large numbers of digital-born maps, elevation models and vectorized themes in the German AAA schema. These objects can be described in the same way as every other archival item. Hence the information on the them can be accessed through the online finding aid system (OLF) as well. Since most of the archived geodata do not contain personal information (except for cadastral records), the legal barriers to access them are generally low.

In accordance to its general strategy on online access to historical records the State Archives release all metadata, digitized maps and digital geodetic data Open Access.

**A digital archival infrastructure for cartographic records**

In order to improve the overall accessibility, the strategic goal of the State Archives is to be able to provide a digital archival infrastructure in which all forms of archival cartographic records, whether analogue, digitized or digital, are presented in an appropriate and efficient way. Such an archival infrastructure must meet certain criteria.

First of all, such an infrastructure must provide adequate presentation and search options for the respective form of cartographic records and for the specific need for information. In other words, there should be different modules to address the very different types and designs of material on the one hand, and to cover different usage scenarios on the other. Two of them already exist. The first module (the online finding aids system OLF) maps the tectonics, structure and hierarchy of the archival fonds

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8. If digitized material does not belong to the public domain yet, it is released under a Creative Comons licence (CC-BY): https://creativecommons.org/licenses/by/3.0/deed.en.
9. In its 2018 revision the Public Sector Information (PSI) EU directive has tightened the obligations of agencies to publish geographic datasets for free. But for archives (and libraries and museums alike), the situation is slightly different. In their case, the PSI directive doesn’t force open access. However, the State Archives is highly motivated to release as much geographic data as possible. For this goal they are partnering with the Baden-Württemberg Agency for Geoinformation and Land Development (LGL BW).
10. For similar considerations see Tegeler/Bauer (2019); Fleet (2019: 141).
and enables a verbalized search; the second module (BildCMS) enables the viewing and downloading of digitized material. A third module, which is designed for georeferenced content, a WebGIS, is only a concept today. A WebGIS creates possibilities of geographical search and, in addition, provides a completely different visual access to cartographic records, especially when comparing different documents and time levels. It should be possible to address all modules in a machine-readable way via an API in order to open up a wide range of subsequent use (Fleet 2019: 144-149). And of course, users should be able to download the content manually in every module.

In addition, the infrastructure should make it possible for users to switch back and forth dynamically between the respective modules of the archival infrastructure, but also to conveniently access knowledge repositories from other sources such as catalogues from different cultural institutions, gazetteers or Wikipedia. In order to do so, it must be possible to permanently address and link the various forms of cartographic records in the best possible way (Tegeler/Bauer 2019). Depending on the type of material, this requires an enrichment of the existing archival description and metadata by use of authority files and/or coordinates.

While meeting these objectives, the infrastructure must be able to ensure the authenticity of the archival records at any time. As a store of knowledge and the memory of a state as well as its administration, it is central for archives to be able to guarantee the authenticity of documents in their holdings. This applies equally to analogue, digital\footnote{Cf. for the Landesarchiv Baden-Württemberg e.g. Keitel (2015).} and digitized archival material (Crom 2019: 121). If geographical information changes in the course of the digital preservation regime or in preparation for a specific form of presentation – e.g. because it is rectified or smoothened – the user must always be able either to return to the original state or to retrace the alteration using the given metadata.

The archival infrastructure must also be able to illustrate the context of the archival records in each module. In contrast to many map collections in libraries, a large part of the maps and plans in archives were not created for a general, open and public use. On the contrary, they were often created in administrative actions for a very specific purpose, which has a significant influence on the layout and design of the material. In many cases a map without this context is not understandable or can give a completely wrong impression. For example, archives contain plans and maps that were created in the context of planning. These records do not represent a factual, but a desired or planned condition, which does not have to correspond to reality (Papritz 1998: 22). The situation is similar with political maps, such as boundary maps (Figure 3), which, like all maps, are bound to a certain narrative (Papritz 1998; Tegeler/Bauer 2019: 110-111; Janes 2012: 121-124). An important, but by no means trivial task of the digital archival infrastructure is therefore to show or convey to the user that a map has a specific context, for example that it belongs to a certain administrative activity and that other information must be taken into account in order to understand it. The hurdles here are on the one hand media discontinuity (a georeferenced map shown in a WebGIS might be part of a paper file presented only in the online finding aids module), on the other hand the archival description by means of ISAD-G, which often "hides" important context information in other hierarchical levels of metadata.
Finally, the infrastructure should of course be easy and intuitive to use, it should be stable and performant and ideally have a rights management system that allows archives to show certain material only to selected user groups or individuals.

![Figure 3: LABW, HStA Stuttgart, N 1 Nr. 3: map showing disputed ownership claims of the Duchy of Württemberg, 1573](image)

**First steps**

On the way towards a digital archival infrastructure for cartographic records, the State Archives have to tackle numerous challenges. On the one hand, some fundamental and strategic questions still need to be addressed. These include, for example, the question of how the German authority file GND, which has so far been optimized only for library purposes, can be used by other cultural institutions like archives to facilitate semantic linking within and between repositories of cultural institutions. On the other hand, the use of different forms of cartographical records requires first of all the digitization of the material, but then also labor intensive improvement or enrichment of the archival description and metadata. This can only be achieved if several approaches are pursued, which shall be outlined briefly:

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13 The Baden-Wuerttemberg State Archives are part of a project concerned with this question. See: https://www.dnb.de/EN/Professionell/ProjekteKooperationen/Projekte/GND4C/gnd4c.html
1. Acquisition of third-party funds – the example of aerial photographs from 1968

The sheer mass of records to be processed cannot simply be incorporated into the everyday line of work. Collecting funding for individual projects is one way of closing gaps in a specific area; it should be used wherever possible. In an ongoing project funded by the Federal Ministry of Education and Research of Germany, for example, the State Archives have had a collection of 19,000 aerial photographs digitized and georeferenced by a service provider. The aerial photographs date back to 1968 and cover the entire area of the state of Baden-Württemberg. As soon as it is completed, the project will make it possible to compare a current map of Baden-Württemberg with the situation of some 50 years ago.14

2. Exploiting the potential of digital geoinformation

After digitizing analog cartographic records, in some cases it may be possible to use digital metadata from other domains to enrich the existing or missing archival description automatically. In particular, such potentials should be exploited largely for already digitized and georeferenced maps, by re-using data from surveying or from well-known gazetteers. In recent years, for example, the State Archives have succeeded in making 17,000 maps of the Württemberg and Hohenzollern 19th century cadaster map series accessible by re-using digital geographical information from the Baden-Württemberg surveying administration (Naumann/Knobloch 2014, Naumann/Ziwes 2014). A similar procedure is planned with the digitized and georeferenced aerial photographs of 1968 (see above) in order to offer an open access service via WMT-protocols.

3. Crowdsourcing

To a greater extent, the State Archives would also like to integrate help and knowledge of interested users themselves. In a first project in March 2018, the State Archives made 3,600 digitized maps publicly available for georeferencing using the collaborative tool Georeferencer from Klokan Technologies.15

Since this was a pilot project and the prospects of success were to be examined as broadly as possible, the selection consisted of four different types of content. In addition to older (16th – 19th century) printed maps, younger printed cadastral maps (19th and 20th century), hand-drawn maps (16th – 19th century) and aerial photographs of the early 20th century were selected.

The examination of the results is still ongoing, but astonishing results can be reported. One year after the start of the project, 95% of the units were already georeferenced in very good quality. Only some older maps and aerial photographs, which were very difficult to locate, caused problems. The difficulties, however, are all to be found in the maps themselves, which simply provide too few clues.

The project was very successful. In addition to the actual results, it brought very positive feedback and media echo to the State Archives. Finally, it stood out due to the energetic commitment of the many volunteers.

14 https://www.landesarchiv-bw.de/web/62684
15 https://www.landesarchiv-bw.de/web/63162
Finally, it is of particular importance that the State Archives have already been able to gather practical experience in another context on the way to a digital archival infrastructure for cartographical records.

With LEO-BW\textsuperscript{16}, the State Archives have been operating a digital information platform apart from their archival services since 2012. LEO-BW offers access to content from a wide variety of cultural institutions and provides information on the history and culture of Baden-Württemberg to anyone interested (Fähle/Neuburger 2014). Right from the start, many people used this service to gain knowledge about their home towns and places, which is why a location-based search is particularly important for LEO-BW. In order to meet this need, a gazetteer with information on all cities and municipalities of the state was implemented at an early stage, completed by a WebGIS (Figure 4). To date, the WebGIS offers, among other things, various layers of current map data as well as material from a historical atlas of Baden-Württemberg. In the near future, the digitized and georeferenced aer-

\textsuperscript{16} https://www.leo-bw.de/
The effort was worthwhile because it made it possible to gain initial practical experience in the implementation of such systems. For years, the system has also provided access statistics, which prove that there is indeed a strong public interest in these cartographic records and it already shows a glimpse of what a sophisticated digital infrastructure for this material can look like.

**Outlook**

It is likely that some time will pass before users will be able to comfortably use a digital archival infrastructure optimized for the need of each manifestation of geographical information. The State Archives have taken several steps in recent years to achieve this goal, both practical and strategic. The involvement of volunteers has also played an important role. Our vision is to be able to integrate this community support more strongly and to transform it into more permanent structures, ideally as part of the archival infrastructure itself. Not only because we need many helping hands to deal with the amount of unprocessed archival material, but also because the work on and with archival records can sometimes be a fruitful collaborative project in which citizen archivists should participate as well as archivists, who earn their living with it.

**References**


