

Marco van Egmond*

The Dutch Landscape of Online Institutional Georeferencing¹

Keywords: Georeferencing, institutional map collections, use of georeferenced old maps

Summary: As early as October 2010, the National Archives of the Netherlands (*Nationaal Archief*) in The Hague launched an internal georeferencing pilot that included the geographical aligning of 700 polder maps in the province of South Holland. As such, it was the first Dutch institution practicing georeferencing in an online and collaborative environment mainly in order to enhance retrieval and user interfaces. From then on, other map collecting libraries and organizations in the Netherlands were to follow the example of the National Archives. How did this development evolve and what does the current Dutch landscape of institutional georeferencing look like? What are the similarities and what are the differences? And what can be said about the response of potential users and target groups to the new access points to map content? Do we know whether georeferenced data are actually used? The present paper will shed light on these questions, and will also deal with some Utrecht user experiences. Furthermore some thoughts will be shared about future perspectives.

Introduction

Georeferencing in an online environment by means of crowdsourcing has a relatively short history. Around 2005 the first applications were launched, for instance *MapRectifier* and sometime later *MapWarper*, which is based on *MapRectifier*. Also *Georeferencer* was introduced. Using this system, as early as October 2010, the National Archives of the Netherlands (*Nationaal Archief*) in The Hague launched an internal georeferencing pilot that included the geographical aligning of 700 polder maps in the province of South Holland. As such, it was the first Dutch institution practicing georeferencing in an online and collaborative environment mainly in order to enhance retrieval and user interfaces. From then on, other map collecting libraries and organizations in the Netherlands were to follow the example of the National Archives.

How did this development evolve and what does the current Dutch landscape of institutional georeferencing look like? What are the similarities and what are the differences? And what can be said about the response of potential users and target groups to the new access points to map content? Do we know whether georeferenced data is actually used?

'Prehistory' of Dutch online institutional georeferencing

So in 2010 the National Archives of the Netherlands in The Hague was the first Dutch institution that had parts of its map collection georeferenced in an online crowdsourcing environment. However, it may be wise to go a bit further back in history and look at an Amsterdam initiative which did not involve crowdsourcing but did present an early form of georeferenced maps in an online environment: the colonial maps of the Royal Tropical Institute (*Koninklijk Instituut voor de Tropen, KIT*).

* Dr. Marco van Egmond (1969) is curator of maps, atlases, and printed works at the Utrecht University Library, The Netherlands [m.vanegmond@uu.nl].

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KIT is an independent centre of expertise and intercultural cooperation in (sub)tropical countries. The library of KIT, which unfortunately had to close its doors in 2013, housed a large collection of maps and atlases. As early as 2005 the colonial maps of the Dutch East Indies, Surinam and the Netherlands Antilles, more than 11,000 documents all together, could be viewed on the internet, making KIT a technological and quantitative trendsetter in the digital map world! The software used to show the digitized maps was tailor-made, making some advanced functionalities possible. For instance, it was easy to navigate through the several sheets of serial maps because the matching index maps were digitized as well and linked to the sheets in question via rasters. From both the map leaves themselves and this index map, it was possible to navigate to the adjoining sheets. Another innovative functionality was the option to search by geographic location. To that purpose thousands of toponyms on coordinate level were entered into a database and linked to the viewer. In this way, the collection could be searched by these locations from the viewer. Next, a blue circle on the digitized map indicated the location searched for. More in the field of georeferencing was the inclusion of a link of the digitized map to Google Earth (kml-link); visitors could get an impression of the location of the map, but the map itself was not shown in the application. After the KIT library closed down, the website with colonial maps was taken over by the university library of Leiden University (figure 1).²

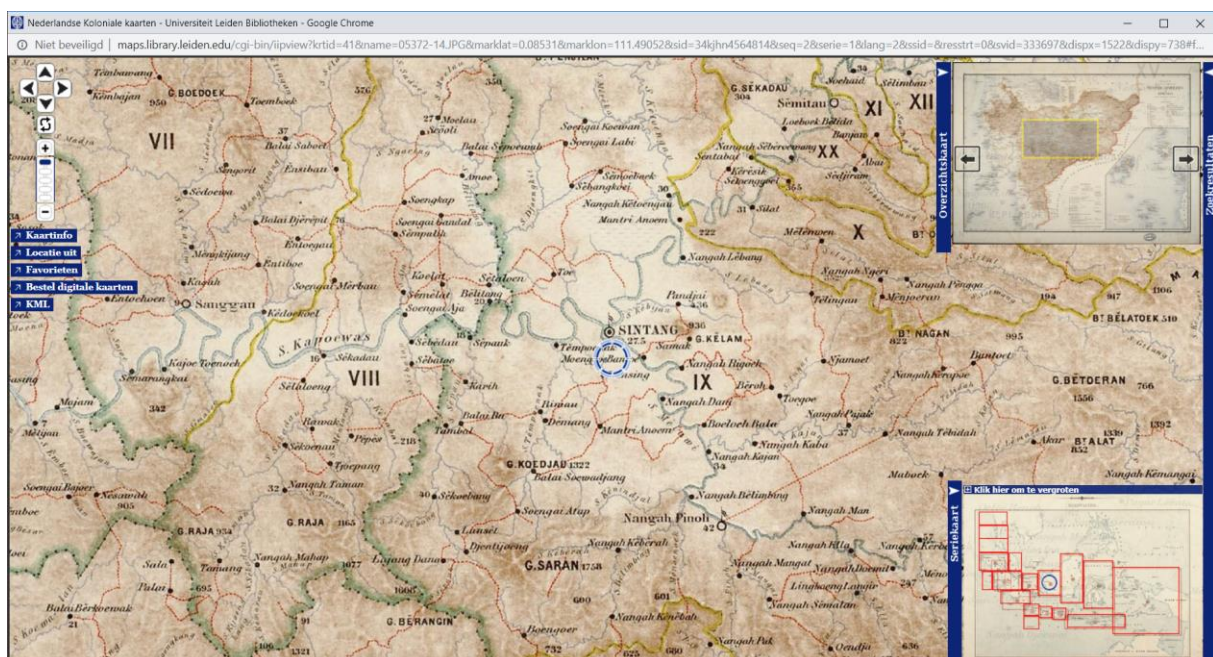


Figure 1: Screenshot detail colonial map series of Dutch East India in the viewer of the KIT library, nowadays Leiden University Libraries.

Another important Dutch website from the days before crowdsourcing was the *WhatWasWhere?* (*WatWasWaar?*), part of the project *Heritage & Location* (*Erfgoed & Locatie*). From 2007 to 2016 this portal helped to find cadastral and topographic maps, but also photographs and other visual material. This material was made accessible via an index map or table of contents. About thirty institutions involved in managing heritage, including many archives, had joined this initiative. However, through lack of funds this website could no longer be continued or further developed.

² Nowadays this important website can be visited via <http://maps.library.leiden.edu>

Current methods of Dutch online institutional georeferencing

At the time, the website of KIT was seen as an exemplary project for digitizing and making old maps accessible, but the initiative was not copied by other institutions. They came up with their own plans, varying in size and using different software and applications. Roughly speaking we can distinguish four different forms of georeferencing in the Netherlands:

1. Georeferencer (with crowdsourcing);
2. Heritage & Location Georeferencing tool (with crowdsourcing);
3. MapWarper (with crowdsourcing);
4. Applications without crowdsourcing

We will discuss them one by one.

Georeferencer

In 2010 the National Archives used Georeferencer for its pilot project on the 700 large polder maps. Initially there were problems with linking the georeferenced maps from the institutional infrastructure, but these problems are solved by now. The follow-up project with the title *Matching maps* contains approximately 2,000 maps of the Dutch East India Company (figure 2).³

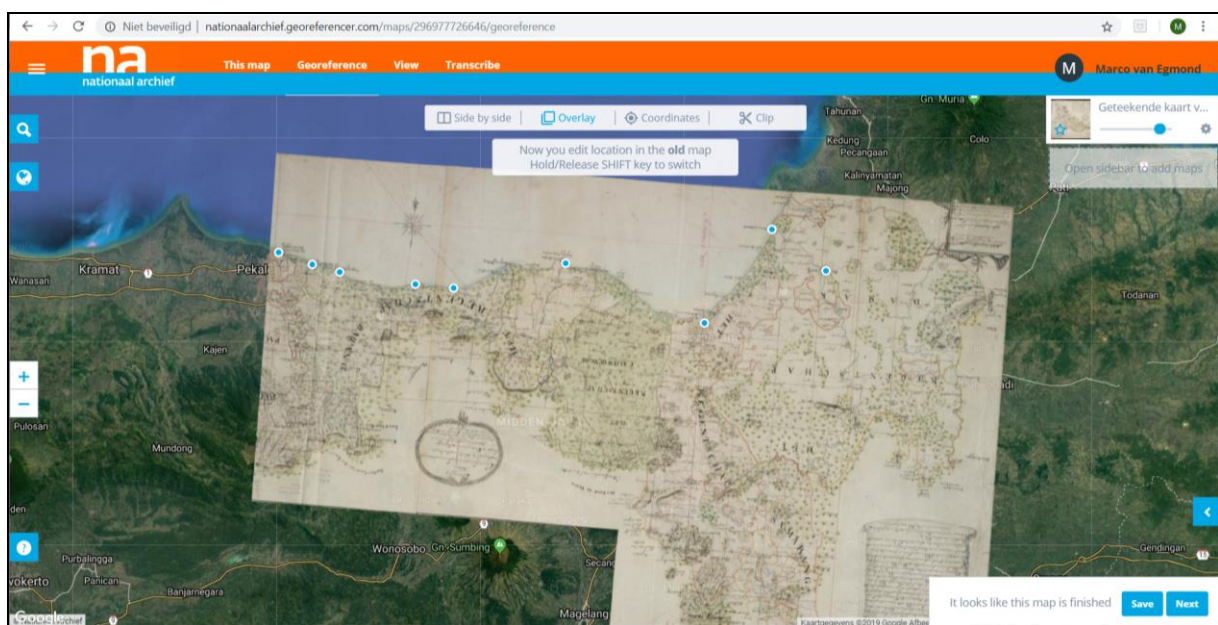


Figure 2: Screenshot ‘Matching maps’ project National Archives, The Hague.

Since 2013 Utrecht University Library has had parts of its map collection georeferenced via Georeferencer (figure 3).⁴ In two pilot projects in the field of water management maps and fortification maps students of the Utrecht University of Applied Sciences did the georeferencing work during some of their lectures. The size of both projects, each about 125 cartographic documents, may appear small at first sight, but the subcollection of water management maps in particular contain relatively many multi-sheet wall maps. These wall maps of mainly water control boards, asked a lot from the staff that had to make the digital montages to be used in Georeferencer (figure 4)! In 2018 a larger georeferencing project followed, with a total of 1,000 old maps of the

³ <http://www.gahetna.nl/themaplein/georefereren>

⁴ <http://bc.library.uu.nl/georeferencing>

Netherlands and Dutch regions. Its success has led to a long-range programme for georeferencing other sub-collections in the near future.

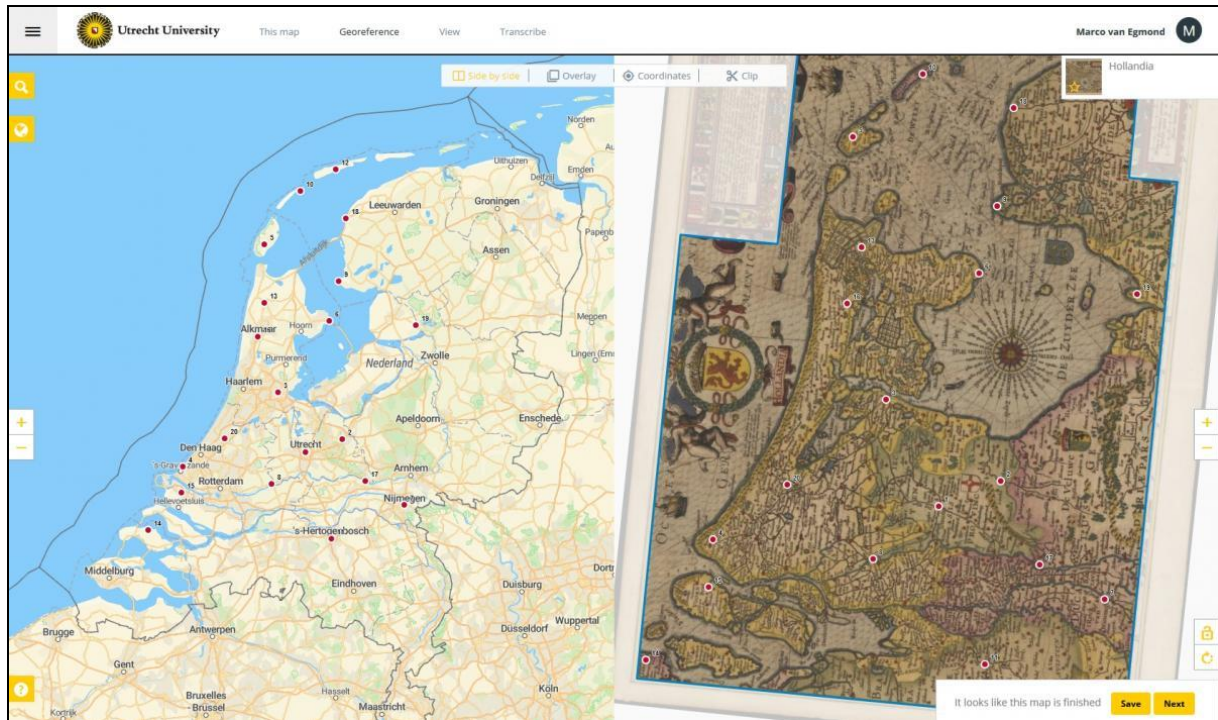


Figure 3: Screenshot georeferencing page Utrecht University Library.



Figure 4: Mounting scheme wall map of the water control board of the Zeeburg- and Diemerdiijk, ca. 1781.

A third Dutch institutional player using the Georeferencer software is the Leiden University Library. Under the title *Maps in the Crowd* this library has made parts of its collection geographical-

ly accessible since 2015.⁵ They started with a pilot project on approximately 400 sea charts by Van Keulen and since then some projects of different sizes have been carried out. For instance, sub-collections of the Royal Netherlands Institute of Southeast Asian and Caribbean Studies (*Koninklijk Instituut voor Taal-, Land- en Volkenkunde*; ca. 7,000 maps of which many belong to a series), maps of the Caribbean area (1,100 maps) and atlas maps of the Asian areas (ca. 300 maps). New sub-collections shall follow in the future.

Heritage & Location Georeferencing Tool

The Heritage & Location Georeferencing Tool has been developed as part of the project Heritage and Location, which included the earlier mentioned site *WatWasWaar?* It is open-source software which can be installed as a stand-alone version within an online environment or otherwise. The tool is implemented in the crowd sourcing platform ‘Many Hands’ (*Vele Handen*) of the Picturae company, but there is no umbrella search interface for all underlying initiatives.

Via the *Vele Handen* platform the Amsterdam City Archives (*Stadsarchief Amsterdam*) had over 5,000 maps of Amsterdam and its surrounding regions georeferenced in 2016 (figure 5). The results have direct links to the website of the archive.⁶ With the exception of an affine or polynomial representation with some basic maps, the tool does not offer further transformation options; there is however a download option for GeoTIFF and GeoJSON, but no link can be found on the website (18 January 2019). There is a reward system: by placing and checking control points tokens can be earned. The tokens may be exchanged for prints of the maps in the image archive.

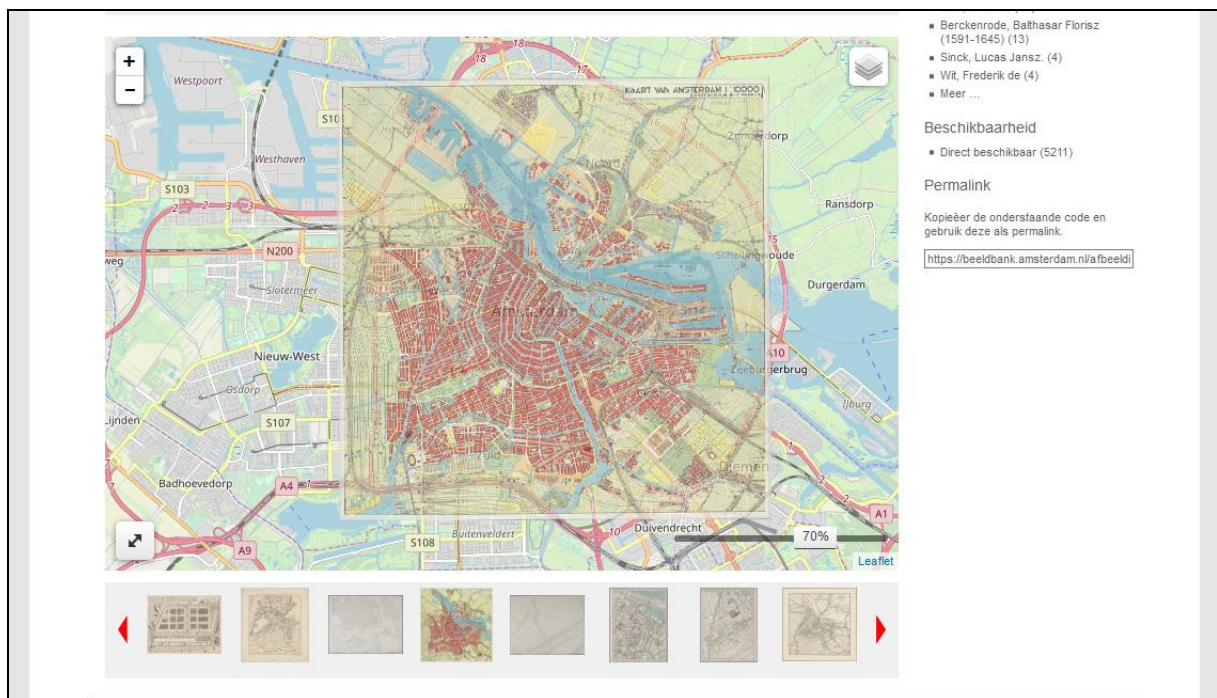


Figure 5: Screenshot georeferenced plans of Amsterdam, Amsterdam City Archives.

A similar project is ‘Make history: Putting Groningen on the map’ (*Maak geschiedenis: Zet Groningen op de kaart*). In 2017 this project resulted in about 17,500 maps from the Groningen

⁵ <http://blogs.library.leiden.edu/mapsinthecrowd>

⁶ <https://beeldbank.amsterdam.nl>

Applications without crowdsourcing

KAART	TITEL	JAAR	BIJGEWERKT	STATUS
	Kaart met landerijen in Voorschoten, uit een kaartboek van het Hellige Geest Weeshuis <i>Kaart met landerijen in Voorschoten. Gesigeneerd door Jan Pietersz. Dou. Met passer en kompas. Uit een kaartboek met 95 kaarttekeningen op perkament waarop landerijen zijn afgebeeld in bezit van het Hellige Geest Weeshuis. Met vermelding van de namen van de pachters. Zie voor een uitgebreide beschrijving van het kaartboek 584_000. Overige vervaardigers: Dou, Jan Pietersz. Rechthebbende: Erfgoed Leiden en Omstreken (In 1 mozaïek)</i> Bekijk kaart Georeferencerde kaart <small>Link: Bron/Referentie</small>	1606	ongeveer 2 maanden geleden	Niet georeferencerd
	"Aanleg van bevoelingswerken ten behoeve der gestichten "Voorgeest" en "Endegeest" te Oegstgeest" <i>Situatie en dwarsprofielen zijn op schaal 1 : 500 en op schaal 1 : 100. Toegangsweg vloeivelden zijn op schaal 1 : 50. Bestek 16 Overige vervaardigers: Gemeente Leiden Rechthebbende: Erfgoed Leiden en Omstreken</i> Bekijk kaart Georeferencerde kaart <small>Link: Bron/Referentie</small>	1911	2 maanden geleden	Niet georeferencerd
	Kaart van landerijen van de heer van Wassenaar... <i>Kaart van landerijen van de heer van Wassenaar gelegen ten zuiden van het dorp Wassenaar tussen de Heerweg en de Kerkdam. Schaal 1 : 1.750 Overige vervaardigers: Coenzoon, Jacob Rechthebbende: Creative Commons Naamsvermelding-Gelijk delen</i> Bekijk kaart Georeferencerde kaart <small>Link: Bron/Referentie</small>		2 maanden geleden	Niet georeferencerd

Figure 7: Screenshot MapWarper application Heritage Leiden & Surroundings.

There are several Dutch websites of heritage institutions which one way or another make use of georeferenced old maps, but not through crowdsourcing. It is not that they don't want to give an insight into a particular (sub)-collection of old maps, but they want to use the georeferenced maps as a layer serving other purposes, for instance as a base for showing localized heritage information or as an analysis tool for carrying out spatial historical research. In these cases, the georeferencing is not primarily focused on realizing a geographical discovery system. A few appealing Dutch examples (the list is far from complete) you see here. Websites with collections containing many georeferenced data and old maps such as Nationaal Georegister,⁹ Publieke Dienstverlening op de Kaart (PDOK),¹⁰ HISGIS,¹¹ Data Archiving and Networked Services (DANS)¹² and *Friesland op de kaart*¹³ are left out, because they lack direct support from map collecting institutions.

An excellent access to Dutch geographic data is Geoplaza of the Free University of Amsterdam (*Vrije Universiteit*).¹⁴ More than a hundred datasets have been made accessible for education and research, of which many are available to external users. Also here some large historical map series consisting of dozens to hundreds of sheets can be viewed as georeferenced maps and downloaded as images.

Many local archives in the Netherlands are associated with Heritage on the map (*Erfgoed op de kaart*).¹⁵ This is a platform making local history accessible. Many municipal institutions have

⁹ <http://nationaalgeoregister.nl>

¹⁰ <https://www.pdok.nl/>

¹¹ <http://www.hisgis.nl>

¹² <https://dans.knaw.nl/nl>

¹³ <https://www.frieslandopdekaart.nl>

¹⁴ <http://geoplaza.vu.nl/cms>

¹⁵ <http://www.erfgoedopdekaart.nl/>

their own websites on the platform, in which georeferenced old maps serve as basic layers for the reproduction of all kinds of localized heritage information.

A popular Dutch site is *TopoTijdreis*, on which the development of the Dutch landscape during the past two centuries can be easily followed (figure 8).¹⁶ To this purpose, the national cadaster has digitized the several editions of topographic maps and georeferenced unchanged. Unfortunately, the metadata for each map sheet with often important information about the date of the representation is lacking.

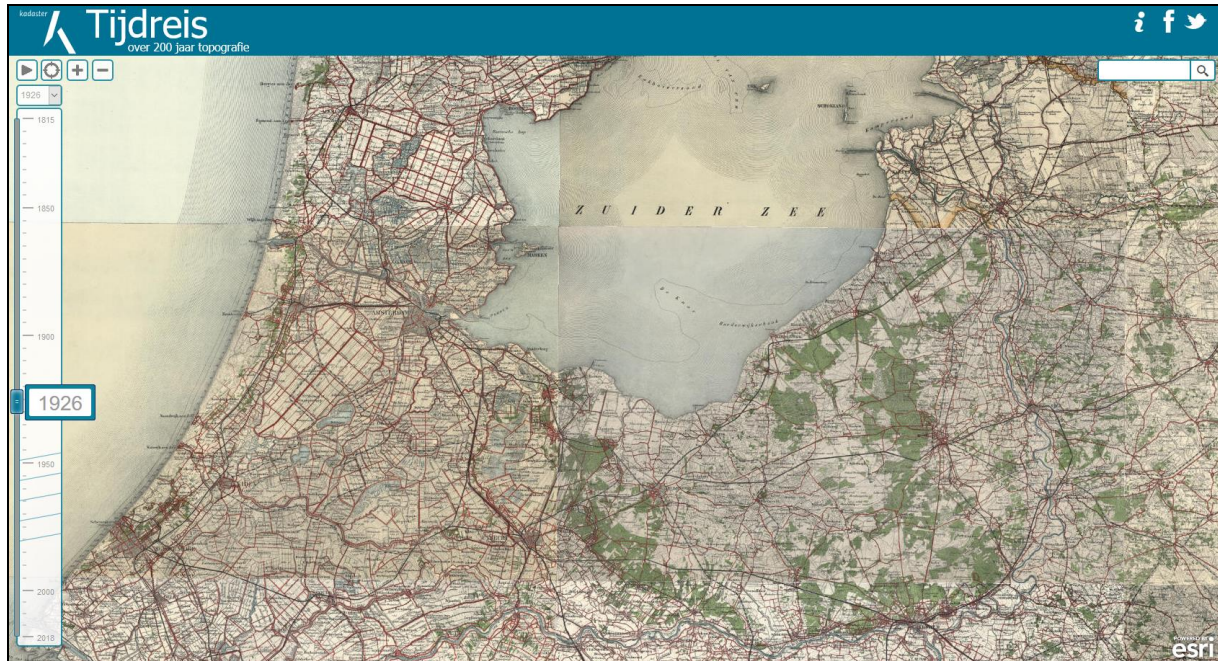


Figure 8: Screenshot 'TopoTijdreis' by the Dutch cadaster.

As part of multi-volume facsimile edition of the *Atlas der Nederlanden* in 2013 the Amsterdam University Library, where the original is housed, decided to georeference the over 600 maps and make them online available.¹⁷ Georeferencing was carried out based on two marking points per map. Transformations are not possible. The interface takes some getting used to (figure 9).

¹⁶ <https://www.topotijdreis.nl/>

¹⁷ <http://mapserver.fa.knaw.nl/atlas/atlas/>

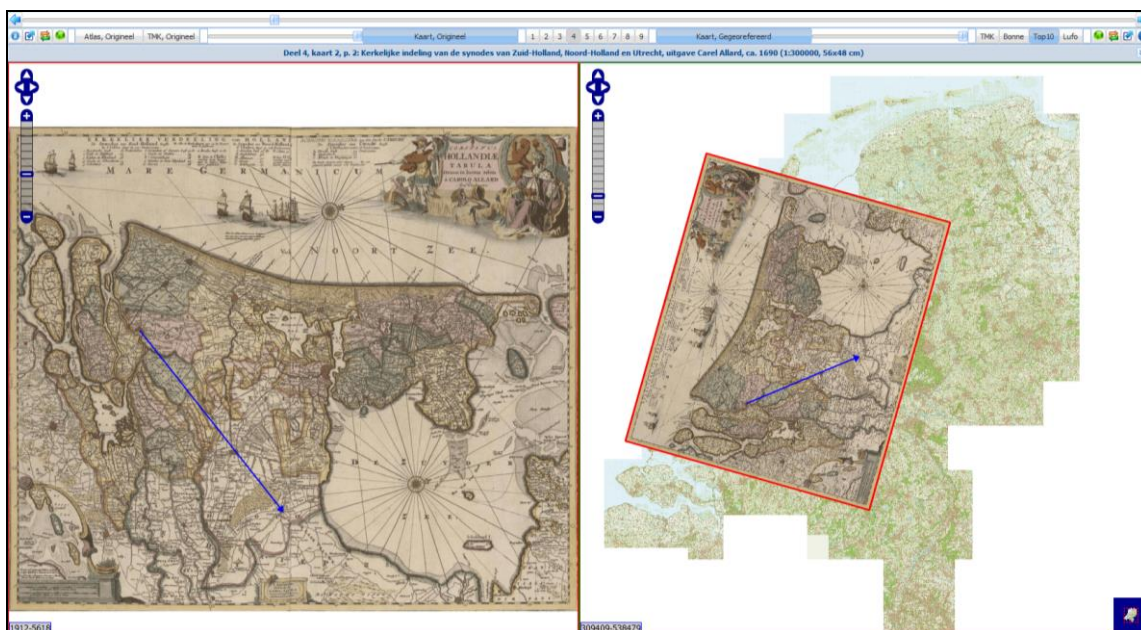


Figure 9: Screenshot georeferenced ‘Atlas der Neederlanden’, Amsterdam University Library.

With the help of the website *Fryslân Uitgebeeld* of the Tresoar in Leeuwarden the province of Friesland can be researched from a cultural-historical and landscape-historical angle.¹⁸ Approximately sixty old maps of Friesland can be projected in transformed states onto four basic layers. The maps can also be put on top of each other and made transparent separately.

Comparison of online georeferencing applications

Comparison of the Dutch websites mentioned above by numbers and elements such as crowdsourcing, transformation options, reward elements, download service and the availability of multiple base layers produces the following table:

	Trans- formations	Reward element	Download- service	Multiple base layers	Number
Applications with crowdsourcing					
<i>Georeferencer</i>					
National Archives	X	X	X	X	2,700
Utrecht University Library	X	X	X	X	1,300
Leiden University Libraries	X	X	X	X	9,000
<i>Heritage & Location Georeferencing tool</i>					5,000
Amsterdam City Archives		X		X	17,500
Groningen Archives		X	X		1,000
<i>MapWarper</i>					
Heritage Leiden & Surroundings			X		
Applications without crowdsourcing					
Geoplaza (Free University Amsterdam)			X	X	ca. 2,000
Erfgoed op de kaart				X	100
TopoTijdreis (Cadaster)					1,000
<i>Atlas der Neederlanden</i> (UL Amsterdam)				X	600
<i>Fryslân Uitgebeeld</i> (Tresoar)				X	60

¹⁸ <http://www.fryslanuitgebeeld.fr/>

The table shows that the applications with a crowdsourcing element contain the most functionalities. This is no surprise because these online applications focus on the discovery of institutional map collections and on the reuse of georeferenced data. As said earlier, the websites with georeferenced maps without a crowdsourcing element are mainly set up as basis for heritage information or as an analysis tool for historical research. The number of institutions which is involved with georeferencing by means of online crowd sourcing is relatively small. Also the size of the georeferenced Dutch map collections is rather small compared to foreign collections.

Some user experiences from the Utrecht practice

In Utrecht, georeferencing old maps during special meetings, in which we use Georeferencer, is always a success. The people doing the work are enthusiastic about the application, the beautiful maps and the digital end result (figure 10 and 11). It is also quite easy to get funding because of the innovative character of georeferencing. But what can we tell about the ultimate use of the georeferenced maps? After all, georeferencing should promote this use because of the improved geographical accessibility and findability and the availability of a download service.



Figure 10: Georeferencing meeting Utrecht University Library (photo: Maaïke Wijnen).



Figure 11: Special map exhibition for georeferencers, Utrecht University Library (photo: Maaïke Wijnen).

However, from the point of view of the Utrecht practice it is not so easy to get a quantitative answer to the question of use. For instance, we do not have statistical data on the download service (yet). Via Google Analytics we can monitor the usage data of our own digital Special Collections. Figures show that the map material is consulted most frequently. But to what extent this is (partly) the consequence of georeferencing remains an unanswered question.

What we can do, however, is to take a look at some user experiences from a qualitative point of view. An example of the use of a georeferenced map from the Utrecht collection concerns a map of the Haarlemmermeer before the reclamation in 1852. This georeferenced map was used as an animation at the latest visitors' attraction of miniature park Madurodam, called the Waterwolf. There is a replica of the 19th century pumping station which was used to reclaim the Haarlemmermeer. The animated georeferenced map gives a very clear picture of the situation before and after the reclamation.

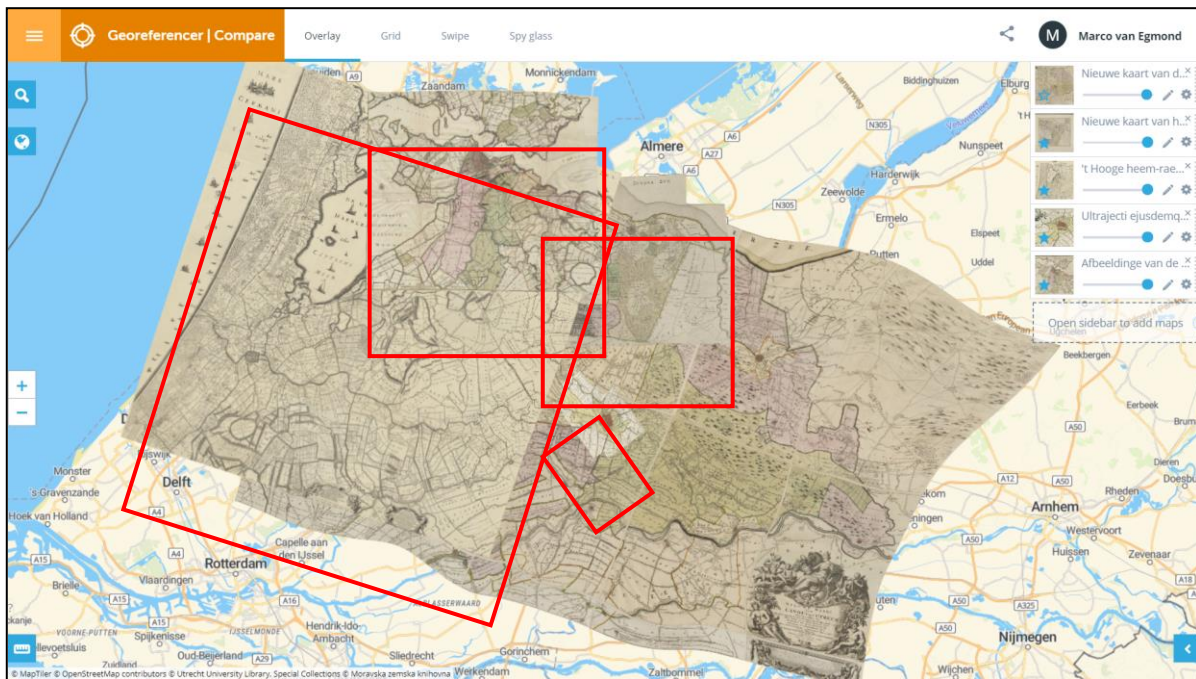


Figure 12: Various map sources for the derivative wall map of Utrecht, 1743.

Another internal example of the use of Utrecht georeferenced maps is the use in education. At some parts in the local teaching of geography the WMTS-links or the GeoTIFFs of these maps is used directly by students in ArcGIS and other systems, for instance as base for the visualization of certain spatial or historical phenomena or as picture of the historical situation of a certain region in a digital atlas produced by the students. I myself am responsible for some applications of maps georeferenced in Utrecht. In a presentation on the occasion of the gift of an 18th century wall map to the Faculty of Geosciences, frequent use was made of the results of georeferencing in analyzing the map content and its accuracy. It was shown that the topographic content of the wall map, a second edition from 1743, had changed at several points compared to the original edition from 1696. At the time, the maker of the map had used all kinds of contemporary, new maps of smaller regions. With the help of the Georeferencer-application this could be demonstrated perfectly by laying these detailed maps on the wall map and making the layers transparent (figure 12). The built-in accuracy analysis indicated that the wall map showed a rather pluriform image with respect to geometry: the map maker had not only used new surveys, but also already existing maps (figure 13). The audience present, mainly directors and scientific staff members of the Faculty of Geosciences, was very impressed by the possibilities of georeferencing old maps and its scientific value.

Next accuracy analyses of georeferenced maps stood at the basis of the discovery of the oldest, topographic map image of the Southern Netherlands and of the confirmation of the fact that the rare Buginese sea charts not only have a common geometrical basis but as to content were mainly influenced by the 18th century French cartography.

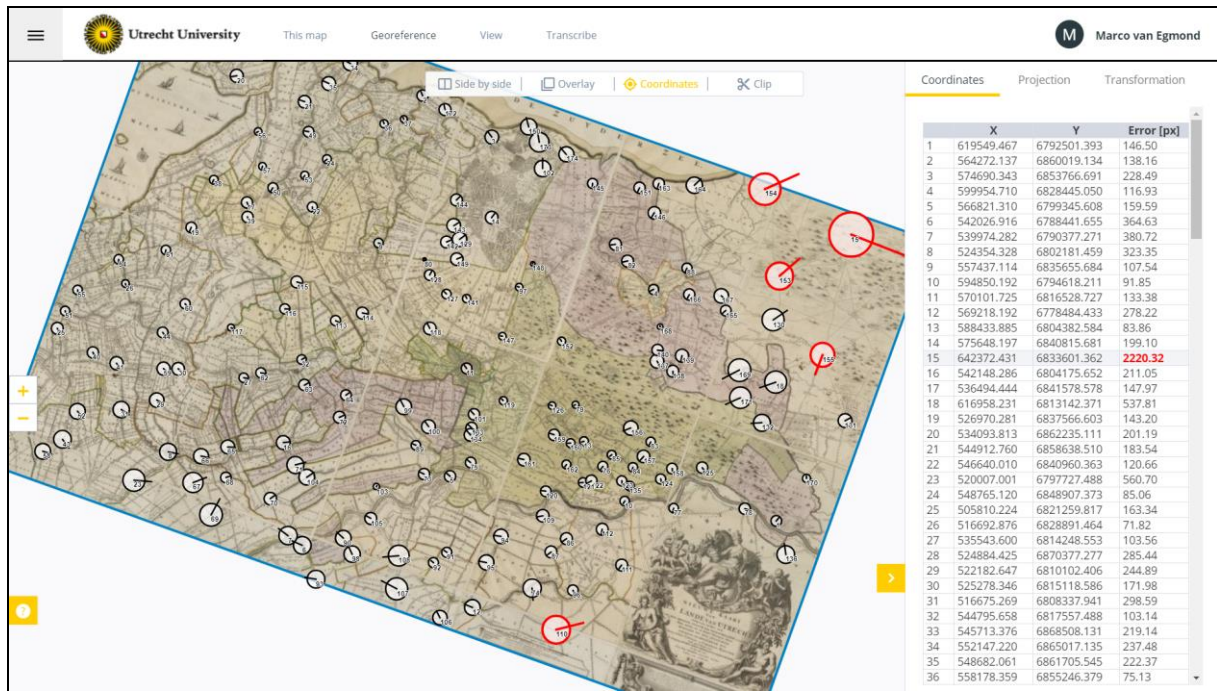


Figure 13: Accuracy analysis wall map of Utrecht, 1743.

Finally the georeferenced old maps in Utrecht are also used at the research group River and Delta Morphodynamics of the Faculty of Geosciences. By looking at the former river situation with the matching sediments and comparing these with the present situation predictions for the future can be made. Based on these predictions the research group makes recommendations for the national and regional policies on river and dykes management.

Future expectations and concluding remarks

This discussion shows that the current Dutch landscape of online institutional georeferencing, as is probably also the case in the rest of the world, is variegated. There are several forms of georeferencing, with or without crowdsourcing. The ones with crowdsourcing, – Georeferencer, MapWarper and the Heritage & Location Georeference Tool, have by far the most functionalities. However, these applications are not very widespread yet in the Netherlands; only a small number of institutions is currently using them. In relation to countries such as England, Scotland and the United States the georeferenced collections are very modest in size.

It is to be expected that online georeferencing will expand more and more: Both at map collecting institutions where georeferencing is part of the daily business and at institutions that stand at the very beginning. Anyway, in Utrecht a long-term vision as to georeferencing has been drawn up in which many sub-collections are ready for georeferencing projects.

From the view of the end user it is advisable to bring together as many georeferenced old maps coming from as many institutions as possible onto one particular search platform or discovery system. But that is easier said than done and the varied landscape of online institutional georeferencing appears to be too fragmented to realise this goal in the short run. Still, the perspective of the end user must stand out as a firm line in the future landscape of georeferencing!

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