Master Geo-Information Science & Remote Sensing

Internship report GRS00000

Building a web-based Geo-visualizati

Fieldnames in Drenthe

Wageningen Universiteit

Waag Society, Project; Heritage & Location

Niene Boeijen

9009

Acknowledgments

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Abstract

Keywords

Abbreviations

H&L

Heritage and Location Project

CH

Cultural Heritage

GIS

Geo Information System

ICH

Intangible Cultural Heritage

RCE

Rijksdienst voor Cultureel Erfgoed

Chapter 1. Introduction

The amount of geospatial data has increased rapidly. Geospatial data is created and used increasingly every day in maps, satellite navigation systems, websites, services and Apps. (MacEachren & Kraak, 2001; Tensen, 2014) Almo geographically referenced (Hahmann & Burghardt, 2013). Next to that, the modern computer technologies provide be institutions, organizations and citizens to create and use geospatial data. (Cartwright, Miller, & Pettit, 2004; Tensen, 2 range of domains, use geo information systems [GIS] for management and decision-making purposes and the fields expanding.

The magnitude and complexity of data sets with geospatial reference are a challenge in information science. How t into information and subsequently into knowledge? Data is a product of research, creation, collection and discover often boring, incomplete or inconsequential. It is not yet valuable as communication, for it is not a complete messa are presented with data instead of information. {see figure # DIKW pyramid} According to Nathan Shedroff, succes do not present data. Transforming data into information by organizing it into a meaningful form, presenting it in an communication context is the process to get the story to the audience. (Shedroff, 1999) The use of the enormous to inform the general public is also still in development. (Tensen, 2014) Geo-visualization is one of the tools to turn geo data volumes from information into knowledge. (MacEachren & Kraak, 2001) Geo-visualization integrates sc cartography, image analysis, information visualization, data analysis and geographic information systems to provide n visual exploration, analysis and presentation of geospatial data. (MacEachren & Kraak, 2001)

DIKW pyramid. From data to wisdom

(Shedroff, 1999)

The web is being used to produce new visual applications, going beyond the status of maps and other represent information. The World Wide Web has become an extremely efficient channel for transferring data, and also, has gre (Cartwright et al., 2004) There is a need for creating user-centered geo designs to ensure that usable geospatial proc delivered. (Cartwright et al., 2004) This raises the interest for geo-visualization in publishing geo-referenced informa getting the enormous amount of available data to the general public (Lin, Gong, & Wang, 1999; Tensen, 2014). Only specifically directed and web geo visualizations emerge which emphasized the scientific information visualization tec handle these very large and complex data sets. New visual forms and practices emerge, but how and why do they conventional cartographic forms?

In this research, web geo-visualization is explored through a case study in the field of cultural heritage [CH].

There is a big relevance of using geospatial data and geo information systems for the field of cultural heritage conserva 2010) Safeguarding and exploiting CH is high on the agenda and includes the use of digital management systems. (M Perrin, Durand, & Drap, 2007) Before this was a hand-made task, but with the growing computer science there a digital preservation, innovation and updating cultural heritage data. (Deal, 2014) The next step is to document cultural geographic space to preserve and safeguard the amount of cultural heritage data on another level. More and mo authorities responsible for cultural heritage use GIS as one of the main infrastructure components when digitalizing C Meyer et al., 2007; Petrescu, 2007)

For cultural heritage data, the issue of the representation of the results of inventories in mapping systems and updating data, remains open. (Martin, Reynard, Pellitero Ondicol, & Ghiraldi, 2014) Web-mapping applications can be used to easy to use formats, for the assessment and promotion of heritage data. (Martin et al., 2014) Web-mapping is a suitab and updating geo heritage data. In general, much of the spatial data being created and shared is strongly visua photographs, video, maps and art (Elwood, 2011) As stated by Deal:

> *Visualizations have the potential to greatly improve search and discovery for online collections, transformi digital collections. Furthermore, changing technology is making it easier than ever to incorporate visualizat and websites. The time is ripe for cultural heritage institutions to begin experimenting with data visualizatio*

In the cultural heritage field, the temporal dimension plays an important role to explore data. (Cerasuolo, Cutugno, & L temporal data visualization assumes and important role in the data presentation to users. The three dimensional d (spatial, temporal and descriptive) helps users understand and gain knowledge in the discovery process.

This research is part of an internship at Waag Society for the project of Heritage & Location. (see chapter $$$) This work and the results from the development of a web-application for the project Heritage & Location.

Because a web-application will be build to visualize geographically referenced intangible cultural heritage [ICH] data oriented research. The context is a dataset of field names that were used by the local citizens around 1800 to refer t fields or areas, in Drenthe, the Netherlands. The information about the landscape that is hidden in the names g information. Yet, noticeable is that this data is only know to a few selected historians. (Spek, Elerie, & Kosian, 2009) T by the *Rijksdienst voor Cultureel Erfgoed* and based on the book *"van Jeruzalem tot Elzelakker, levende veldnamer* (Spek et al., 2009). More about the data will be described in chapter $$

The research will be build up in 3 parts; first the possible visualization techniques will be explored through literature st techniques, the application will be build, for which certain design goals and requirements will be defined. In the en shortly be evaluated.

1.1. Design goals

1. The goal is to preserve the living heritage names of Drenthe, which are mostly stored in people's memory an
2. Give people the possibility to explore them, discover them. For names cannot be found in the real surroundi and now given a place to *exist*.
3. Getting the stories out of the raw data and show people the surprising knowledge that stays hidden. Help peo heritage and so the history of the Dutch landscape. Engage people in something interesting about the landsc

We will do this by building an attractive web-application for the project Heritage & Location to show its potential of visu and preserving them. A big part of the web application will be a geo-visualization of the intangible cultural heritage o names from Drenthe. The interactivity of the web application, will give users the possibility to discover the names ther the environment. The focus is on revealing hidden meaning of the raw data, to the general public.

1.2. Target group

The target group will be defined as the common citizen, living in Drenthe and show an interest in their direct envi discover something about its history. It will not specifically be targeted at children or elderly but to a general public language is Dutch.

1.3. The objectives

The target group must feel:

1A. Attracted to use the application 1B. Attracted to stay and play around with the application 1C. Challenged to explo

The target group must be able to:

2A. Discover the meaning of the field-names in relation to their environment 2B. Discover interesting stories and surp field-names 2C. Understand the field-names and their value

The application must be:

3A. Intuitive and simple to use, so it shows quick and surprising results on the actions of the target group 3B. Tech efficient and error-safe way. User friendly.

Chapter 2. Background

In this chapter, the field names are further explained and their role in the cultural heritage field. Therefore, Also the fie
is explained and its categories. Because this research was conducted in the scope of the Heritage and Location proj
this will also be elaborated on. Also some background information on geo-data and the combination with heritage is g

2.1. Field-names in Drenthe

A field-name is a toponym used for a small area of land or a certain surrounding. Mostly arable land, pasture lands, was
areas, hills, valleys, woodlands and swampy areas. The names are thought up by the local inhabitants for practical u
and spatial orientation. A field-name is often only existing in oral form and originates, develops or disappears w
changes. This makes field-names living heritage (see next section) and it exist only in people's memory. There
away from daily lives and disappear with new generations. Written documentation of field-names date from the 1
century. Some names live through because they were taken up into official cadastre documentations or other landsc
Nowadays, a new interest arrises for field-names as they can tell us how the landscape used to look in the 18th ce
field-names was gathered by assessing peoples memories, old cadastre documents, maps and other collections. Thi
made tangible, by documenting as much as possible and digitalizing them into a GIS system.

Field-names tells us how the landscape used to look, which soil types, vegetation types or animals occurred. They link
or environmental characteristics of the direct village surroundings. The origin and meaning of field-names are mai
geography of its direct environment, like water bodies, streams, soil properties and altitude in relation to its surrou
used for landscape design and planning, knowledge for historical research and inspiration source for artist. (Spek et a
- Encyclopedie Drenthe Online," n.d.)

2.1.1. Living heritage

The field-names in Drenthe are called living heritage, which is one of the 4 kinds of cultural heritage categories acco
institution;

1. The physical environment. Including monuments, archeology sites and cultural landscapes.
2. Paper heritage; Stored in archives and libraries in the form of paper documents, maps and books.
3. Object collections, owned and displayed by museums. Only focusing on objects.
4. Living heritage; habits, traditions, religions and cultural events that people experience. From: ("volkscultuur,"

Categories 1,2 and 3 are tangible substances while category 4 is intangible heritage. UNESCO introduces the c
heritage data in 2003, to safeguard the importance of intangible cultural heritage and distinct it form tangible heritage
(“UNESCO Culture Sector - Intangible Heritage - 2003 Convention :,” n.d.-a)

The Convention of UNESCO introduces five domains of ICH:

- oral traditions and expressions including language as a vehicle of the ICH
- performing arts (dance, music, theater)
- social practices, rituals and festive events
- knowledge and practices concerning nature and the universe
- traditional craftsmanship, meaning the skills and knowledge involved rather than the craft product itself

The boundaries between those domains are extremely fluid (“UNESCO Culture Sector - Intangible Heritage - 200
b). In the scope of the H&L project this research will focus on the connection of place and time in intangible cultur
be shortly explained as all traditions and rituals of normal life, (Zeijden, 2011) which gives people a sense of identity
is transmitted from generation to generation and can be constantly recreated by communities due to interaction wi
(“UNESCO Culture Sector - Intangible Heritage - 2003 Convention :,” n.d.-b) Intangible heritage is strongly depende
space and influenced by the space. Of course these traditions, habits , etc., have a place where they take place. Or th
have a spreading, an origin, a continuation, can cover multiple places, through time. (Karavia & Georgopoulos, 2013)
for the field-names in Drenthe, which is oral living heritage. Originated with a strong influence of the direct environmen

2.2. Waag Society

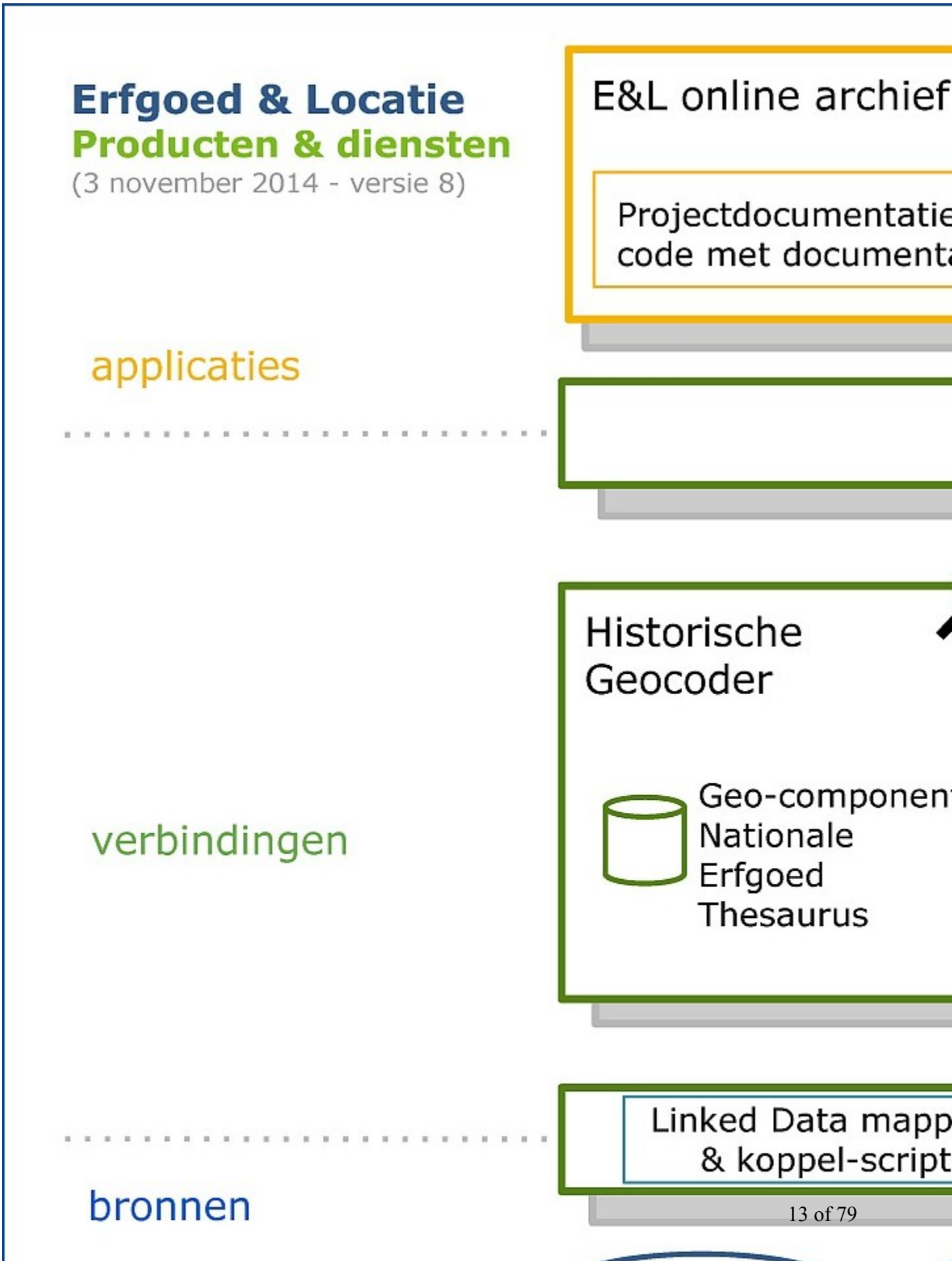
For this research takes place in the scope of the Heritage and Location[H&L] project at Waag Society, they both will b

Waag Society is a Institute for art, science and technology. They develop technical interventions for relevant social
they conduct creative research in the form of projects, creative care lab, creative learning lab, future heritage lab, futu
design lab and open wetlab. The Heritage & Location project (see next section) is part of the future internet lab [FIL]
the development of big and open data, making internet technology accessible and research the impact of the interne
Society,” n.d.)

2.2.1. Heritage and Location project Waag Society

The project H&L is owned by the Rijksdienst voor het Cultureel Erfgoed [RCE] , and at Waag Society a historical-geo
are developed. The H&L project aims to develop a uniform system to link CH collections to existing geometries, v
indicators in the metadata of the CH data. One of the tools is a historical-geocoder, to make heritage data, geo locate
and space to other heritage data sets and enrich knowledge. It combines multiple geo data sets with a time compon
easily to locate heritage data with a place notification. Big heritage collections with a place indication, though no geo
to geometries. The goal of the H&L project is to know every place, administrative boundary, building and address th
Netherlands. Figure $$ shows the overview of the whole H&L project. Now focusing on the historical geocoder and
n.d., “Erfgoed & Locatie,” n.d.)

Figure 1. Sheme of Hertiage and Location project. Products and Services.


Erfgoed & Locatie
Producten & diensten
(3 november 2014 - versie 8)
E&L online archief
Projectdocumentatie
code met documenta
applicaties
Historische
Geocoder
Geo-componen
Nationale
Erfgoed
Thesaurus
verbindingen
Linked Data mapp
& koppel-script
bronnen

2.3. Cultural heritage data & GIS

There is a big relevance of using geospatial data and geo information systems for the field of cultural heritage co (Droj, 2010) Explained here are several reasons why a GIS system is beneficial for digitalizing CH data; One, digi web GIS system can serve the goal to preserve the CH, by presenting the digital records in the form of focusing on Geographical information systems have proved their potential to present and exploit cultural heritage data. (Karavia & Meyer et al., 2007) Second, such a system can be used for research aims. (Karavia & Georgopoulos, 2013) Impleme spatial correlation of the CH data. The geographical relation and connection among various cultural heritages can be s evolution through time and space and relationships between different datasets.((Karavia & Georgopoulos, 2013; Lai, So GIS can help to correlate and exploit heritage spatial relations and enrich the knowledge already existing. (Kara 2013) This is also the third and the main goal of the Heritage & Location [H&L] project, for which this research is intend datasets, by linking it in space and time to other datasets, which do not contain exact location data but do contain a thematic data description. By doing so, it is possible to improve the information access and improve the richness o cultural heritage institutions. ("erfgoedenlocatie.nl," n.d.) Assumption is that the place referred to in historical docume the identical real-world place if they are related in name.

Digitalizing heritage as linked data contains the following key aspects:

1. Identification, making the objects unique and identifiable.
2. Make it accessible through the Internet
3. Searchable, making it possible to index by search engines.
4. Re-usability. Linked-data makes it easy to use the data.

("DEN | DE BASIS vindbaarheid," n.d.)

2.4. Geo data

Geospatial data is data with a location, a connection to a location and oriented by their geographical relationships. G of threefold: spatial, temporal and descriptive. (Mennis et al., 2000) The spatial dimension can be used to interpret th and relation of data entities, an absolute and enclosed *space* wherein the geographic phenomena exists. The tempo used to interpret the change in the data through time. The thematic dimension is to interpret what the data is about be measured and assigned. (Mennis et al., 2000) The data component only concerns the raw observational data, w attributes. (Mennis et al., 2000) These three characteristics will be explained in detail in the next sections.

2.4.1. Spatial dimension

Geo data is different from other data because it is inherently structured with a spatial dimension. An X and Y location dimension. This contains the *where* of a particular phenomenon. Spatial objects can be physical, real objects in the w phenomena, like administrative boundaries. Continuous data fields cover large areas with no clear boundaries, like ra A single object on the earth is discrete; they have sharp boundaries, like a house. But also the spatial structure phenomena, is it random or regular clustered. The general assumption of spatial correlation tells that close things are far apart things.

2.4.2. Temporal dimension

The time of happening of phenomena can be divided into 3 forms, it can happen/exist as a point in time, a period in interval in time. Also time can be classified into the four measurement classes, nominal ordinal discrete or continuous would be; the 90ties, Christmas or the WWII. Ordinal contains relative order time statements like; before, after. seconds, minutes , etc.

Another differentiation is liner versus cyclic time ordering. Linear time is ordered along a path. Cyclic time follows a phases. Like seasons, day and night. Serial periodic data is periodic time represented on a linear path.

2.4.3. Thematic dimension

The theme or attribute of a phenomena. The ‘what’ is happening in the world. This data is often stored in the attribu then one attributes can exist. This data can be qualitative or quantitative, nominal ordinal discrete or continuous.

2.5. Geo-visualization

Geo-visualization is a combination of communication, scientific information visualization, geographic information syste It comes after the collection of data, transformations and analysis. From the real world we go to data and all the mod Eventually the data will be visualized, either a computer or on paper. The perception of people will interpreted the da into knowledge. In general, every map is a selective representation of reality and subjected to the interpretation of the h et al., 1992)(MacEachren & Kraak, 2001)

2.5.1. Static geospatial visualization

Geo data has three basic symbols to represent the data, points, lines and polygons. Selecting the right graphic c
display is a challenging issue. Effective symbolization requires human creativity and judgment. The classic metho
Bertin's theory. This provides a classified system with four levels of data measurement and a list of graphic symbols
to the visual variables. Bertin's graphic variables are locations, size, density/size, texture, color, orientation and shape

Figure 2. Bertin's theory

Alt text *(Dibiase et al., 1992; Bertin, 2000)*

After Bertin, other researchers have added to this method with more graphic variables. Morrison added more sp
existing out of hue, saturation and value. MacEachren (1995) added the term clarity, build up from crispness, resoluti
Caivano (1990) adds more dimensions on texture. Defining directionality, size and density of texture.

Deciding the right graphic variable to be assigned to a certain type of data, helps the viewer in defining the perce
example, ordinal data needs the perception of being ordered, quantitative data of being proportional. While nomin
perceived as distinct categories.

(Dibiase et al., 1992)(Dibiase et al., 1992)(Nöllenburg, 2007)Bertin, 2000)MacEachren (1995)Caivano (1990)

2.5.2. Dynamic geo-visualizations

Bertin's theory was designed in the context of static maps but is for a part the basis and seems applicable to the des
which require a set of dynamic graphic variables. A few forms of dynamic geovisualization can be named, animatio
spatial temporal visualization and interaction. The dynamic categories are divided into 2D and 3D animations. In this re
with 2D animations because of limited technology. Also in the theoretical frame work we will leave this out of consider

They state that the dynamic visual variables will only give the right results when combined with the traditional st
(Köbben & Yaman, 1996)

Animation

Animated maps leave interaction aside, and use time to add a visual dimension to the display. The scenes in an anim
f the data at one moment accordingly. There is hardly any interactive control. Dynamic animated variables are

1. temporal position, when something is displayed
2. duration. how long is something displayed
3. order, temporal sequence
4. rate of change
5. frequency, speed
6. synchronization Animated maps contain dynamic variables. Scene duration, rate of change, scene order. (Or

(Kobben and Yaman) (MacEachren)

Spatial - temporal

Spatial temporal visualization is the display of dynamic pehomena as a series of static maps. To analyze and un temporal change of phenomena. The two categories are temporal animation and non-temporal animation. In tempor time and world time are directly related. While for non-temporal, no direct relation between display time and world ti and Klomp give a slightly different categorization, but can be compared to the Köbben & Yaman. Kraak & Klomp ta successive build-up and changing representations. See table #.

(Dibiase et al., 1992)(Nöllenburg, 2007)(Köbben & Yaman, 1996)

Dibase states that dynamic variables can be used to emphasize the location of a phenomenon, emphasize the a change in the spatial, temporal or thematic dimensions. (Dibiase et al., 1992)

Table 1. Categories of possible animations for dynamic phenomena.

Köbben & Yaman		Kraak & Klomp	
Temporal	Direct relation between world time and display time	Time-series	World time
			Aggregate
			Database
Non - Temporal	No direct relation between world time and display time	Successive build-up	
		Changing representations	

Information from (Köbben & Yaman, 1996; Kraak & Klomp, 1996)

Dynamic visualization variables are identified by Dibiase et al. (1992), MacEachren (1994), Kobben and Yaman, and gathered here and put into one overview. Based on Blok Blok provides a framework for animated representation of phenomena. (Blok, 2000) She provides a range of dynamic visualization variables to be used for monitoring purpose relationships. Blok's framework more aims at the exploratory use of visualization while this research, aims at the displa part of the geo-spatial phenomena for explanatory use. Though, this author finds that Blok's dynamic visualization var for both purposes. As Blok also states; the ultimate goal is to contribute to the development of representation methods which are also found in the explanatory visualization forms.

1. No change
2. Change Variables in the spatial domain

Appearance/disappearance - born die Mutation - in size, shape - increase/decrease ordinal, interval ratio - grow, shrin

Movement in spatial position - along trajectory - boundary shift

Variables in the temporal domain

- moment in time
- pace
- duration
- sequence
- frequency

Variable in thematic properties - mutation - thematic change

(Tensen, 2014)

Interaction

Interactivity is one of the key aspects of geo visualization. The full potential of interaction in geo visualization lies in lin the same data on the screen. Term used is Guided discovery. Interactive visualization gives the control of the anima engage in sorting, highlighting, filtering and transforming. The level of detail displayed and the speed can be determi less likely to be missed.

Two main interactive visualization techniques are introduced by Buja et al. form Nöllenburg (2007).

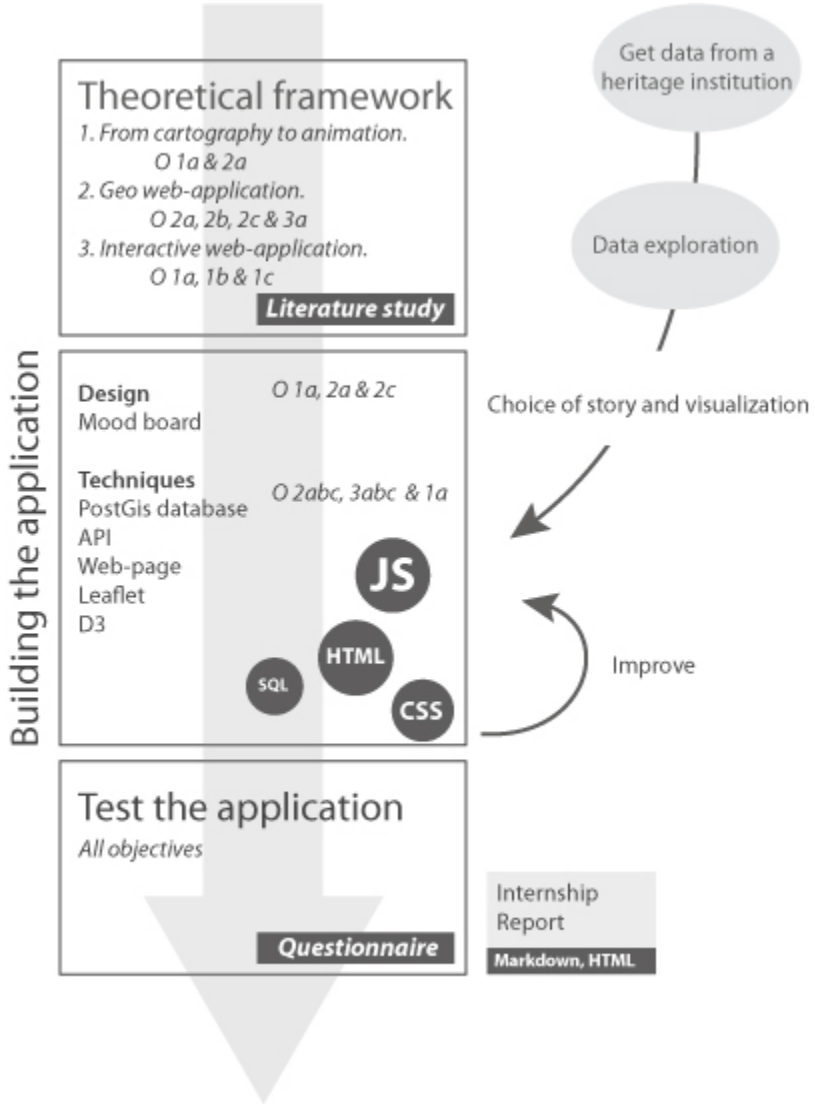
1. Focusing individual views The user can modify the single display and what is seen. Choose the perspective of detail. For example a set of navigation controls can be provided to zoom, pan and rotate. Layers can be s attributes can be available to choose from.

2. Linking multiple views Linking means simultaneous highlighting of data items in multiple views in possible combined with brushing; selecting display objects by pointing on them or encircling them on the screen. T because data can be displayed in different ways and be analyzed from different perspectives. The number, different views depend on the task, the user and the available space on the screen or specific interface. (Nöll

Chapter 3. Method

This research will be a design-oriented research, trying to fulfill the design goals and objectives. By taking the objecti
goals will be fulfilled. There fore the objectives are given numbers and letters, to easily refer to them, when they are c
for an overview of the working procedure and where the specific objectives are addressed. The whole process will b
chaotic then the overview shows. Most creative choices and decisions will be taken by the researcher and her prefere

Figure 3. Methodology overview



Once the general goal was established; making a web-based geo-visualization, the case study in the field of cultura defined. This, because the internship is conducted for the project Heritage&Location at the Waag Society. In the pro institutions take part, and so came into contact with possible data providers. After explaining the general goal of this st needed for this report was provided by *Rijksdienst voor Cultureel Erfgoed*. With the data, the subject of the research t

The report will be build up in 3 parts; first geo-visualization and web-application techniques will be explored through the found techniques, the web-application will be build, for which certain design objectives will be defined. In the end t tested according to the set objectives and found literature.

3.1. Theoretical framework

Three things will be looked at in the literature research. First, a literature research is done into geo visualization tec available methods. Going from the conventional cartographic techniques to the modern techniques. Including animat to cover objective 1a, to make the application attractive, and 2c, understanding the geo-data. Second, literature abo applications and the available techniques will be consulted. To cover objectives, 2a, 2b, 2c and 3a. Adding knowledge preceding research. Last, will be looked at some frameworks explaining how to build an efficient, attractive and intera in general. Covering objectives, 1a, 1b and 1c.

This will all be summarized into the theoretical framework which can be found in the results chapter. The found li to make decisions while building the main application. Therefor the focus of the chapter will be on the field-nam characteristics and visual variables.

3.2. Building the web-application

After exploring the field-names dataset, a choice of story and way to visualize the data is made, which will be expla This will immediately be implemented into building a web-based geo-visualization. The focus will be on building the finding the best way to visualize the data. While doing this, decisions and choices will be made on the developed fram several things that will be taken into account during this stage.

Section $$1

- The idea and design Section $$2
- Techniques needed to make the web-application. (O 3a, 3b and 3c)

- Techniques for geo support. (O 2 and 3)
- Visualizing of the geo data. (O 2) Section $$3
- Designing the webpage. (O 1a)
- Writing the information in text, that is needed in the web page. (O 2a and 2c)

Both the design and technical building will be done by the researcher.

3.2.1. The idea

Because the origin and meaning of field-names are mainly influenced by the geography of its direct environment, like w soil properties and altitude in relation to its surroundings. In order to visualize this relation, as stated in objective surrounding in relation to the name has to be shown. Because the field-names are already categorized by a previ distinction can be made.

Several ideas came up to do this, as many characteristics are of influence. The main goal for the visualization can be

Visualize the meaning and origin of the field name by showing its relation with its direct environment.

The first ideas:

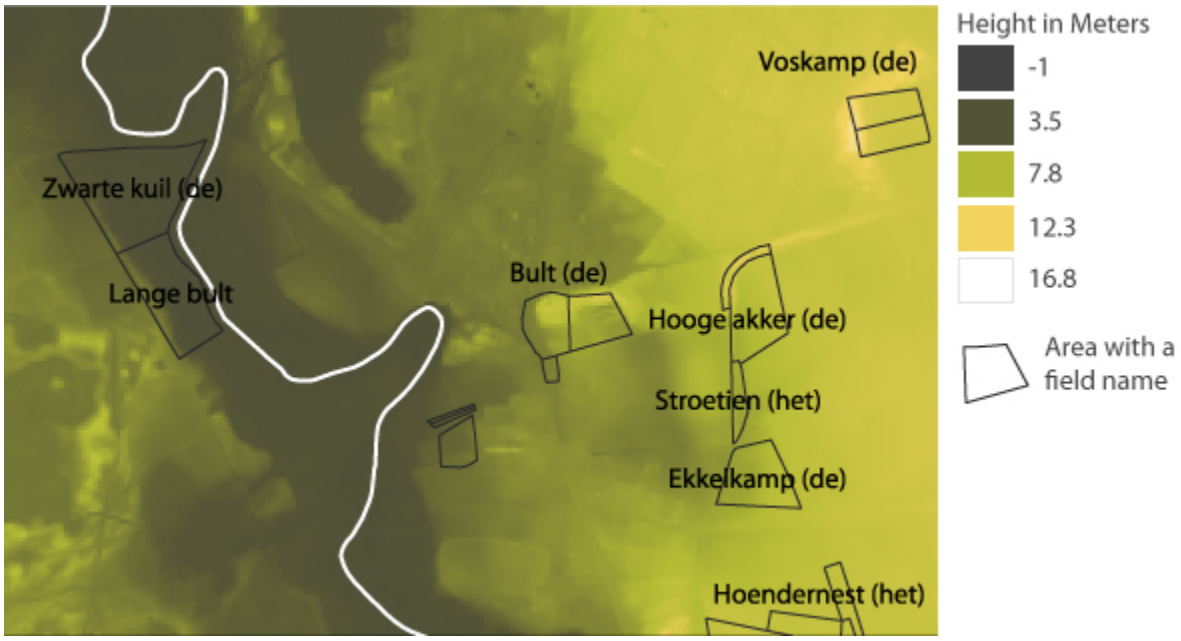
- Showing soil related field names on a soil map. This can be a current or old soil map.
- Showing height related field names on a height map.
- Showing ground water levels in relation to field names about water, swamps and soil types.
- Vegetation types, present on a field in the current situation vs what the field-name tells us about the historic v
- Showing names with relation to wind direction, in their position relative to the closest town or city

Main idea

Eventually one of the ideas was chosen. Namely, showing the field names on a height map. By doing this, it include to water and swamps, for lower areas are more wet then higher areas. Also vegetation types, dependent on wet or included for their is a relation.

Figure # shows some fields with names related to height. Though less clear then the examples above, some fiel
increases or decreases in the in relation to the area around. The Bult and the Hooge Akker are clearly on higher grou
the West. Where de zwarte kuil indicates that it is a lower field.

Figure 4. Field-names example of names with height indication on the height map



Though, field-names are only related to its direct environment, as far as the naked eye could see, for it is human inve
a field with a name can only be shown in relation to the direct environment, and not on a general overview map. For e
'Bultakker' (bump field) tells up that this field lies higher then its surrounding fields, not what the exact altitude it is. In
in the visualization, showing the polygons on a map won't be sufficient. Chosen is to draw a transect of the height o
names of the fields on this.

// tekeningetjes

Interactivity will be added to the transect line, letting the user define the transect line themselves and explore the diff
on and around the transect line.

For this is needed:

Webpage

A map showing the area, where a line can be drawn to locate the position of the transect line. A area where the define drawn and can be explored. A explanation about how the application works. Other interactive features to navigate thr

Data

Data about the height of the study area and all the field-names with its categories. Additional stories and explana meaning and origin of the field-names. Additional pictures of the landscape characteristics.

Backend

Linking the data with the webpage. See paragraphs $$$$.

Variations on Main idea

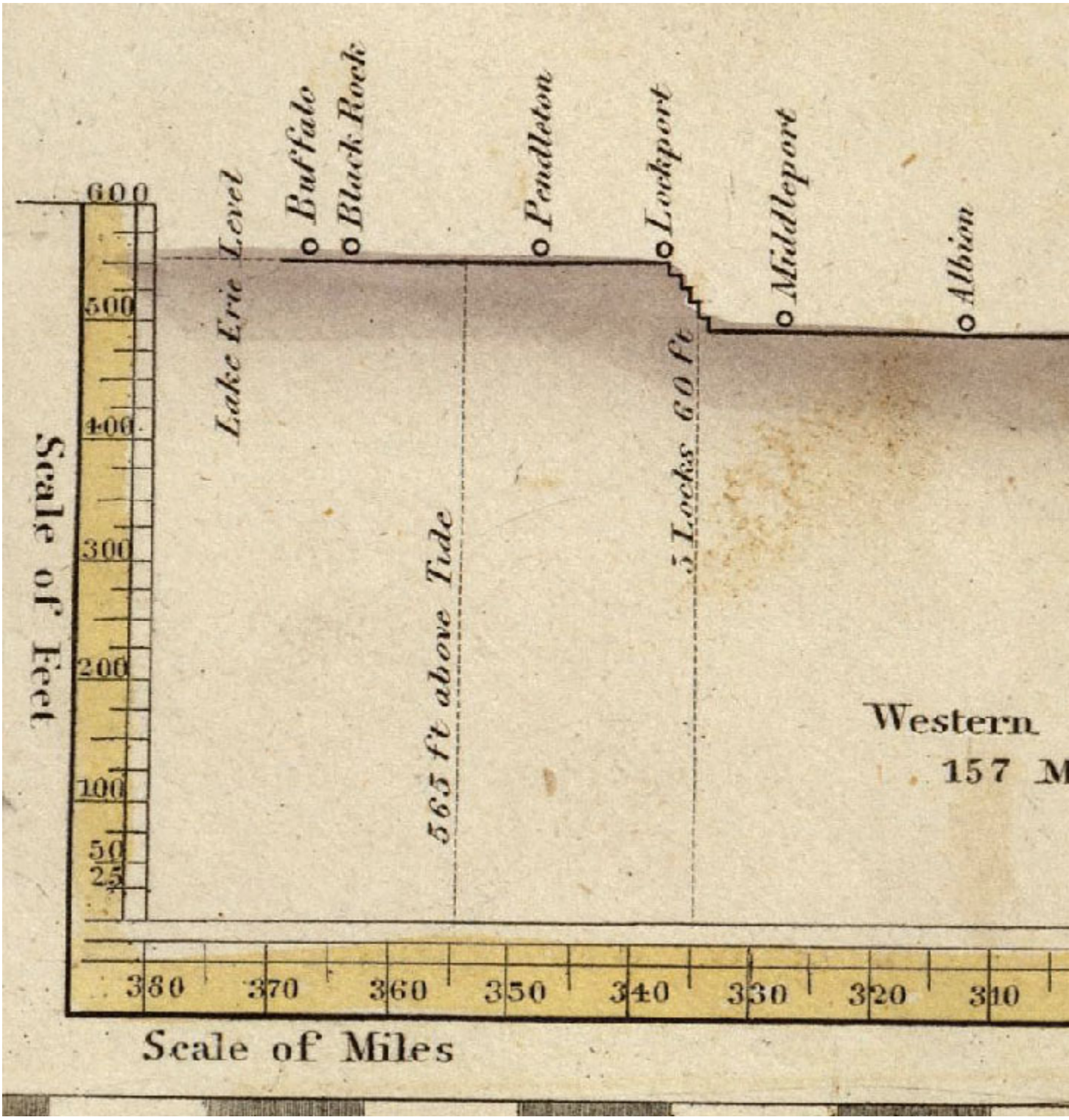
For also on this main idea some variations can be made, these will be shown here.

- soil properties as colors of the fields. Or pattern of the specific soil type. Like stones, clay, sand etc. Giving according to the soil property. Like a stonefield or redfield.
- Pop-ups with explanations and texts. Linking field-names to textual explanation, adding pictures of the characteristics. Vegetation types, animal occurrence.
- Adding pictures or symbols of vegetation types and animals on the transect line. As well as houses to ind bodies as blue dips in the transect line.Give more explanation per category or field-name type. Include pictu animals with which the field name is connected.
- Creating a small 3d landscape by adding multiple transect lines, stacked in front of each other
- Link stories provided to the line, so popups with provided stories from the book.

Mood board

For design ideas and color use a mood board was made. Pictures from the Internet combined with fonts. Search terms cultural heritage, transect , old transect map and more. One of the main inspirations was the following image:

Figure 5. Inspiration Picture



Source: https://commons.wikimedia.org/wiki/File:1832_Erie_Canal.jpg

Complete mood board; see appendix $$$

3.2.2. The data

Field-names

From the *Rijksdients voor Cultureel Erfgoed* of the Netherlands a dataset with living field-names in Drenthe was supplie
field geometries that have a field-name, a name or toponym given to the plot or area by the people living in the neigh
1830. These field-names were derived from studies by Naarding and Wieringa, together with het *Drenthse Archie
Instituut. Old toponyms on old maps, tell us a lot, but here they used another source; the memory of the local inhabitar
after generation the field names keep on living. The polygons where drawn by hand or the names were assigned to pl
maps from 1830.

These field-names contain a lot of information about how the landscape used to look. Because most field-names
direct environment. The most important factors influencing the forming of field-names are ; natural relief, natural wate
structure. (Spek et al., 2009) This information is highly important for nature conservation and heritage preservation. (S

Further reference about the field names in Drenthe can be found in the book “Van Jeruzalem tot Ezelakker, Levende
de Drentse Aa”. (Spek et al., 2009)

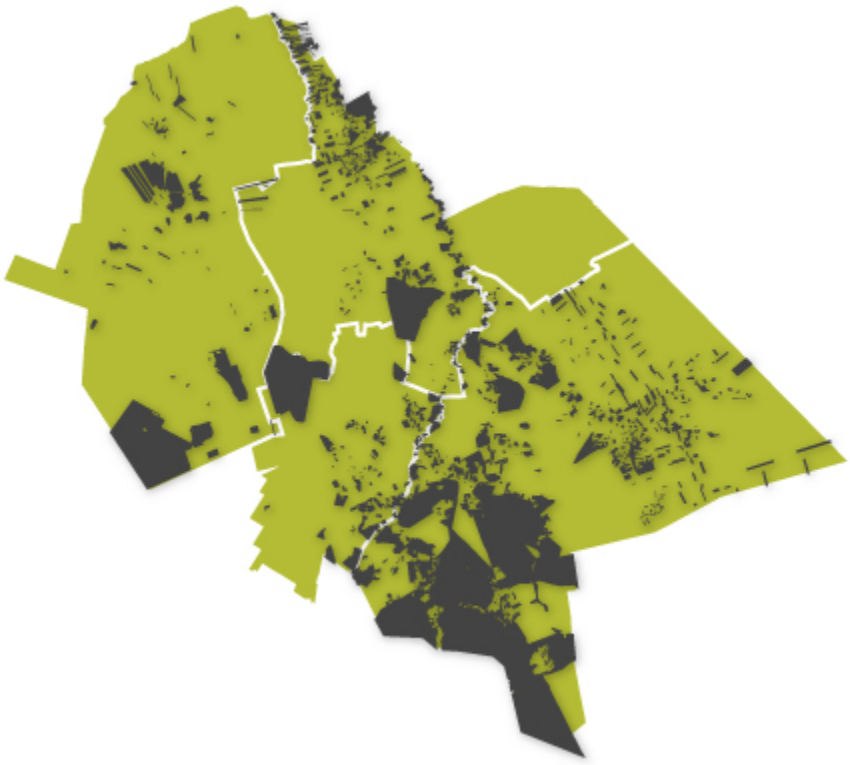
The dataset contains in total 1747 polygons with a field-name. Projection Rd new. EPSG28992

Table 2. Field-name Amounts per source

Amount	Source
459	cadastre topographic map from 1832
452	Landjouw
278	Wieringa
18	Kadaster
515	Drents Archief

This results in the following coverage of field names:

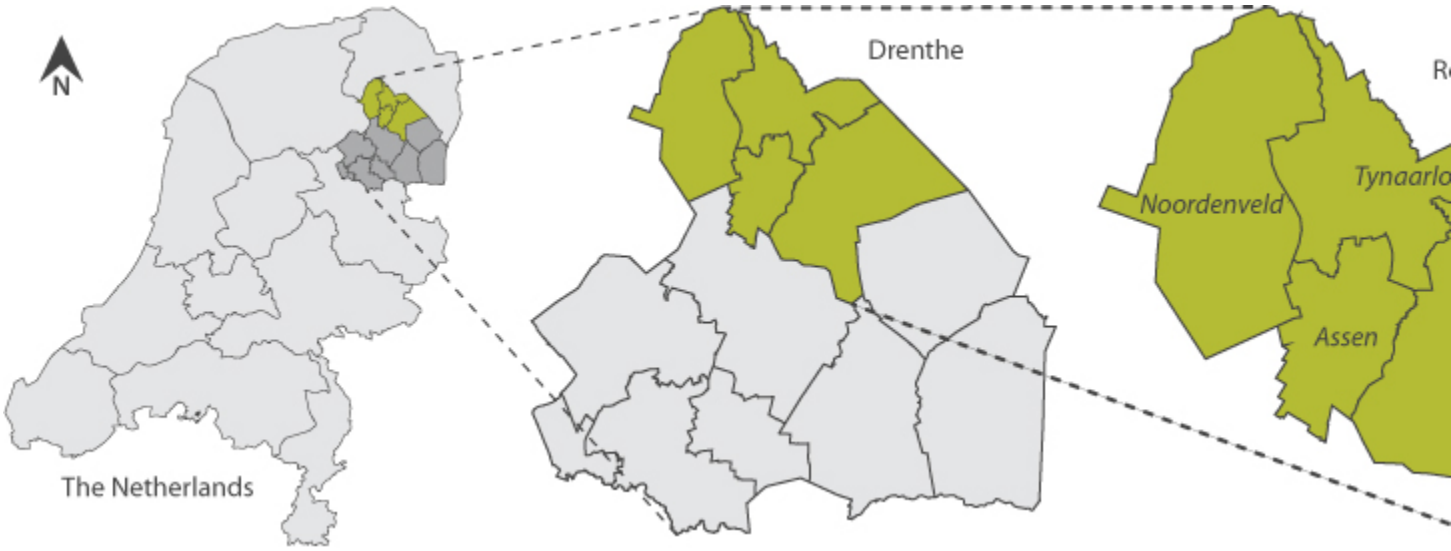
Figure 6. All fields with a field name.



Based on this the total research location is determined, consisting of the municipality's Aa en Hunze, Assen, Noorde

All located in the watershed of the Drentse Aa.

Figure 7. Research area, location in the Netherlands and the municipalities



The field names are already categorized in a previous study by the RCE by $$$. The categories give a meaning t environmental characteristic was of influence on the name creation. These categories are given in table $$#. In the overview of the categories and the names and alternative names can be found.

Table 3. Field-name categories

Code	Category	Count old	Count new
A	Altitude	116	1109
B	Soil type	79	551
C	Water related names	33	199
D	River valleys and swamps	270	926
E	Forest	175	3146
F	Drift-sand fields	59	223
G	Wild animals	38	181
O	Miscellaneous	0	85
W	Wind direction	0	165
Total		770	6585

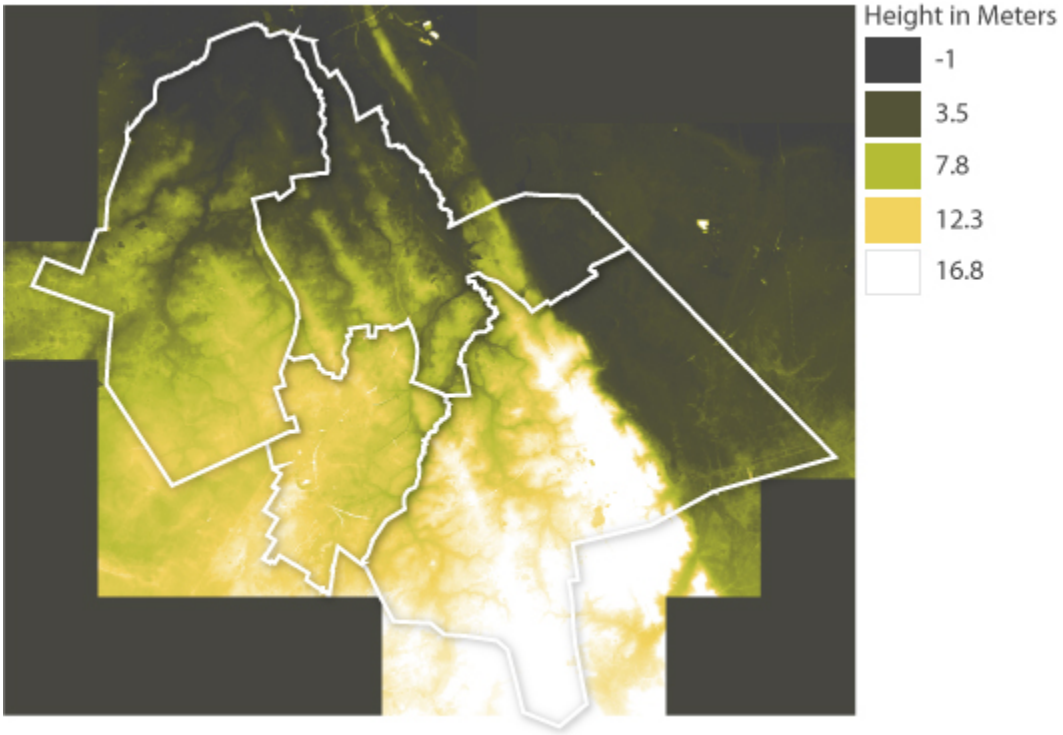
AHN

The AHN2 tiles covering the research area were downloaded from nationaalgeoregister.nl to show the relation of the environment. The AHN has proved useful for historical research. Small differences in the landscape can be se already historians and archeologist use it to discover old settlements that cant be discovered with the naked eye. (Ac Nederland, n.d.)

The raster data has a resolution of 5 meters and a precision of systematic and stochastic error of max 5 cm the pr EPSG28992). (Actueel Hoogtebestand Nederland, n.d.)

The maximum and minimum values of the total area are 29.5 and -1.9 meters respectively.

Figure 8. AHN2 from the research area



See appendix for table with all the tiles used.

Kadaster parcels 1830

Data from the cadastre were also supplied by the RCE, showing the plots and parcels as they were in 1830. And car
field-names to. The dataset is in projection RDnew(EPSG28992).

Water bodies

The water bodies are downloaded from the open data PDOK.nl. The Top10NLactueel contains all topology of the Ne
of 1:25.000. From this dataset only the water polygons are used and clipped to the research area. So the names of
be included into the application. ("TOP10NL | Publieke Dienstverlening Op de Kaart Loket," n.d.) EPSG28992

Table 4. Map sheets Top10NL downloaded

Top10NL_17O
Top10NL_1rW
Top10NL_1rO
Top10NL_1rW

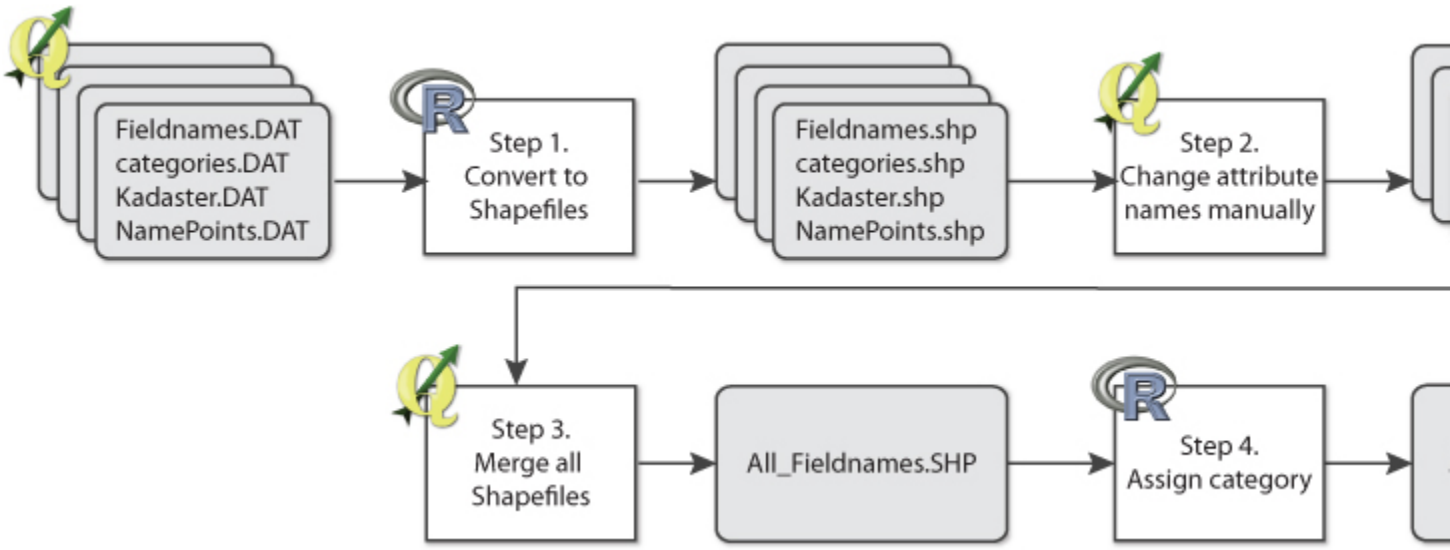
3.2.3. Pre-processing the data

Fieldnames

All the data was delivered separate .DAT files and scattered over several folders and sources. All the possible data
names were collected and displayed in one view. So this results in different sources saying something about the nam
in plots with multiple names, some differed slightly, some were totally different.

In order to work with the files in Qgis all the files needed to be converted to shape-files. This was done in R. See s
QGIS, manually the attribute names needed were changed in one standardized name in order to merge all the data to

Figure 9. Flowchart field-name dataset processing



Code Snippet 1. SQL adjustments

```
UPDATE veldnamen3 SET naam = naam_2 WHERE naam IS NULL;
UPDATE veldnamen3 SET atoto_co_3 = code_3 WHERE atoto_co_3 IS NULL;
UPDATE veldnamen3 SET atoto_co_2 = code_2 WHERE atoto_co_2 IS NULL;
DELETE FROM veldnamen3 WHERE naam IS NULL;
ALTER TABLE veldnamen3 DROP COLUMN naam_2 CASCADE;
ALTER TABLE veldnamen3 DROP COLUMN code_1_ CASCADE;
ALTER TABLE veldnamen3 DROP COLUMN code_2 CASCADE;
ALTER TABLE veldnamen3 DROP COLUMN code_3 CASCADE;
ALTER TABLE veldnamen3 DROP COLUMN code_4 CASCADE;
ALTER TABLE veldnamen3 RENAME COLUMN atoto_co_1 TO code_1;
ALTER TABLE veldnamen3 RENAME COLUMN atoto_co_2 TO code_2;
ALTER TABLE veldnamen3 RENAME COLUMN atoto_co_3 TO code_3;
```

Because this resulted into a lot of overlapping areas, instead, the field-names were all linked to the Kadaster dataset fr
layer of polygons with multiple names is the result. This was done by spatially joining the datasets, or joining by the
most of the datasets contained. The ID contained; municipality, sheet map number, parcel number.

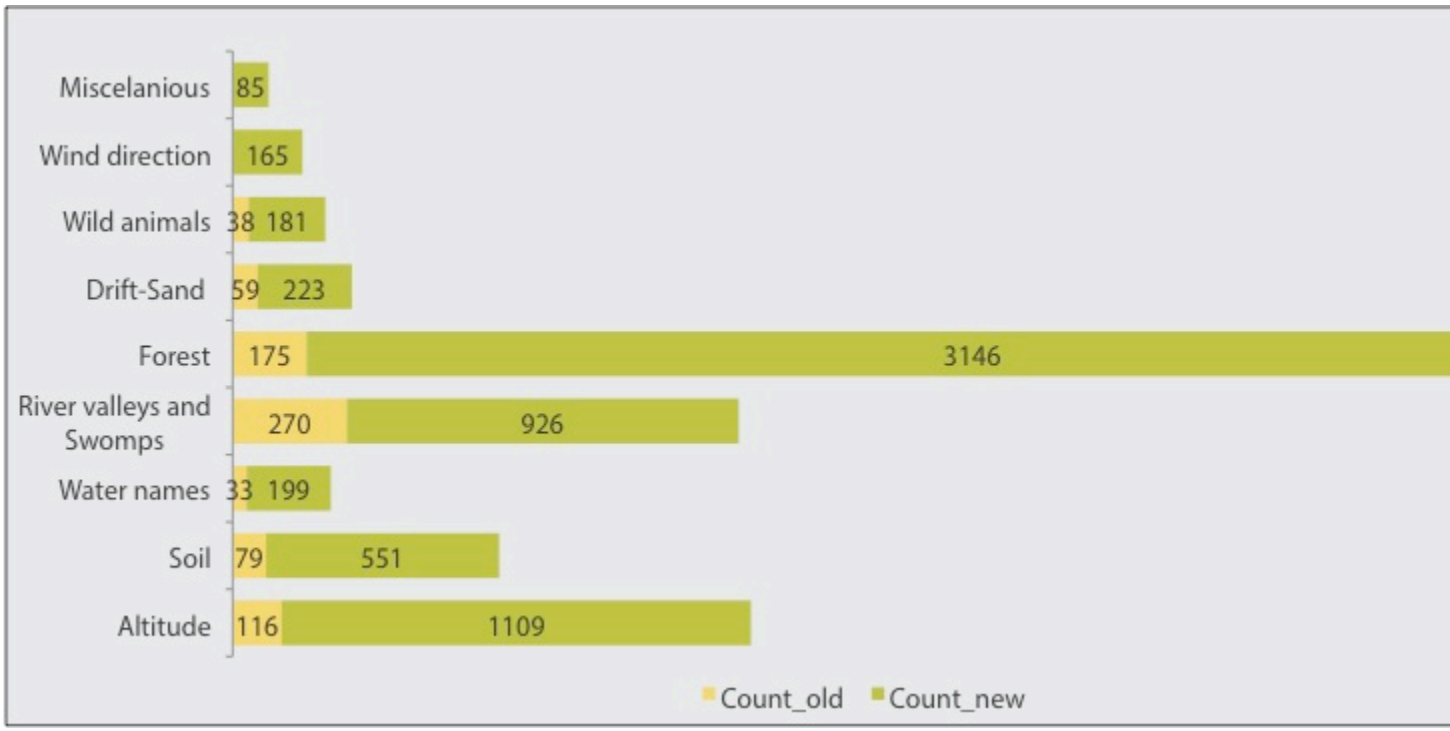
Eventually, the field-names that had no category assigned had to be classified as well. The cadastre field-names and
in the previous reseach by the RCE, but were added here, to have more coverage and amount of field-names.

The classification was done in R. See appendix for the script. $$ A field-name can consist out of multiple words with
and multiple categories and lemmings can be assigned to one field name. The classification provided by the RCE was
per category, different codes and alternative words that signifies the same.

The script runs through all the field-names and all the possible categories, to match which category was applicable.

While reading few of the names, new ideas for a category came up and added. The category wind direction W.

Figure 10. Amount of field names with a specific category, before and after categorization in R



AHN

The AHN is measured with laser altimetry or LIDAR. Laser beams shot from an airplane and localized with GPS. several time periods and merged in the end to get a detailed measurement of the height. The eventual end product c to ground level.(maaiveld) So vegetation, buildings and other object do not appear. (Actueel Hoogtebestand Nederlan areas are given no-data values.

For use in the application, the transect line looks best when not containing any gaps. Therefore, the no-data value no-data tool of Qgis. This takes an average of around 100 pixels to calculate the average height of the missing pixels.

Figure 11. Flowchart AHN2 raster processing

- add field to water with value = 2
- rasterize water with celsize 5
- substract from AhN with raster calculator The water topology is .. into raster format. Giving pixel values of .. 1 calculator these values are subtracted from the AHN to lower the water bodies areas.

Kadaster parcels

No preprocessing needed other then explained in $$ preprocessing field-names.

Water bodies

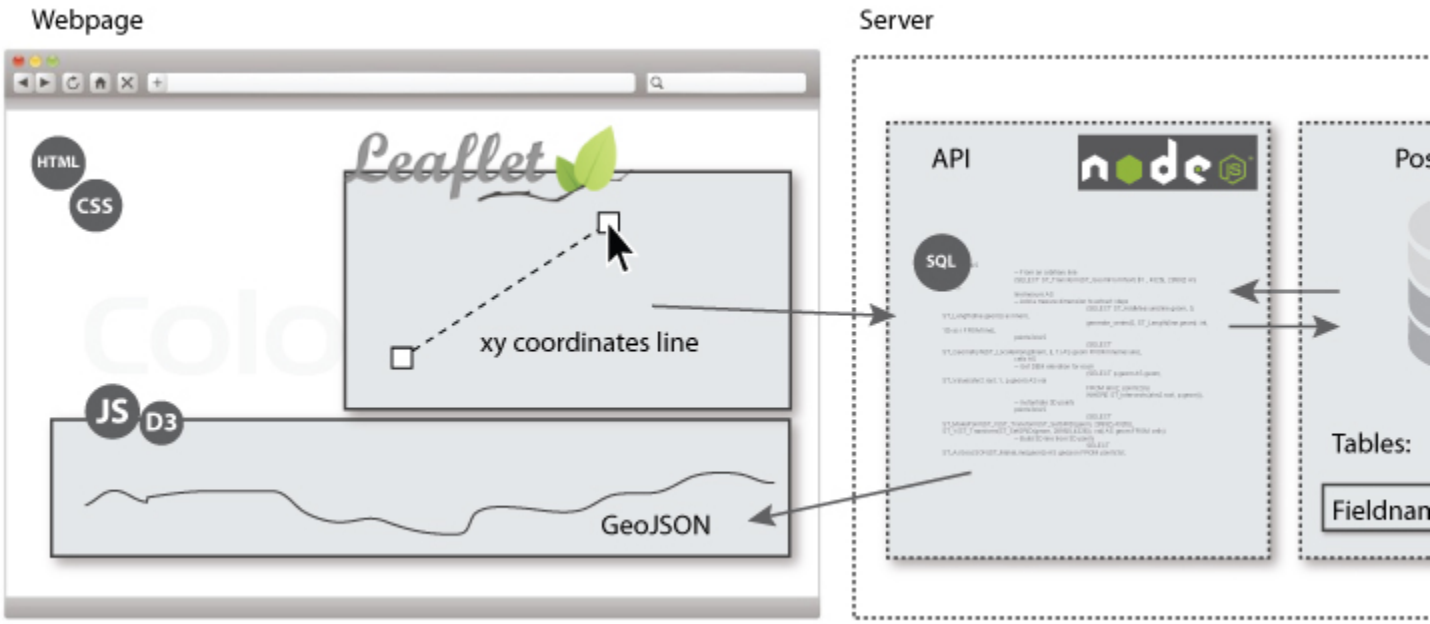
Only processing was clipped to the research area. No other preprocessing needed other then was used for the AHN.

3.2.4. Back-end processes

First both client side and server side are build on one computer as a single seat set-up, in order to develop and test the desired result is achieved, the possibility to move it to a server will be regarded.

Figure $$ shows the overall setup of the system. On the web page a line can be drawn by LeafletDraw on the Leaflet m of this line are edited to a line string format and parsed into a SQL query. This query is explained in paragraph $$$. T the API wich requests the data from the PostGIS database. The response is a geoJSON array containing the heights of the line. This data is parsed back to the script of the website and used to draw the transect line and all the other ch The next paragraphs explain the database, the API, the SQL query and the website.

Figure 12. Back-end processes

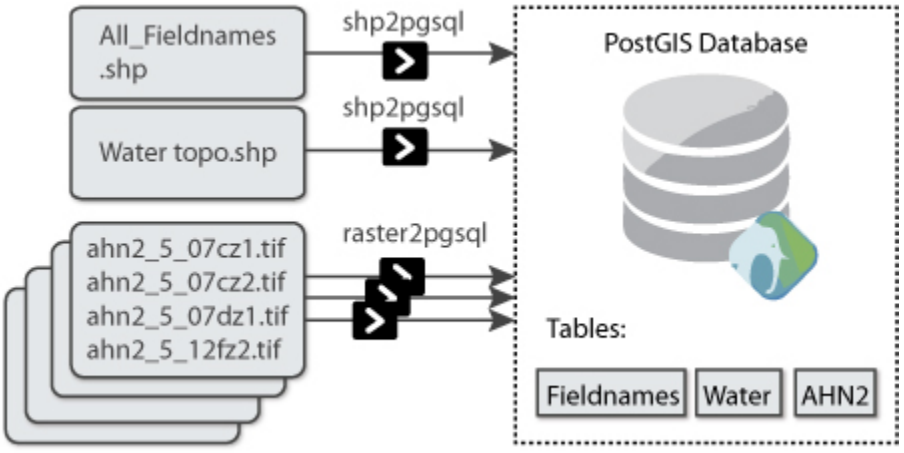


Setting up the database

The open source database PostgreSQL was installed with a PostGIS extension to create the needed database. It
popular free and open source spatial database (Steiniger and Hunter 2013). The PostGIS extension enables geograph
files and rasters.

Everything was loaded in the Dutch projected coordinate system RD new (EPSG:28992)

Figure 13. Loading data into the database



Code Snippet 2. Loading data in the database

```
Shp2pgsql
➜  ~ shp2pgsql -s 28992 /<path name>/veldnamen.shp veldnamen | psql -U user -d veldn

Raster2pgsql
➜  ~ raster2pgsql -s 28992 -I -C /<path name>/ahn2*.tif public.ahn2 | psql -d veldna
```

Setting up webserver or web API

A API or application programming interface, is needed to conect the web-application with the data in the PostGis datab
Brianc node-postgres is used. Done with Node-Postgres for PostgreSQL client for node.js with pure JavaScript bindi
a chunk of software code written

It supports parameterizes queries for PostgreSQL

So the functions are made to get from coordinates to a SQL query asking the height data from the AHN raster. https
node-postgres https://nodejs.org/about/

Code Snippet 3. Request & Response for transect line

```
app.get('/transect', function (req, res) {
  query(queries.transect, ['LINESTRING (' + req.query.linestring + ')'] , function(er
    if (err) {
      res.status(500).send(err);
    } else {
      res.send(result.rows.map(function(row) {
        row.geometry = JSON.parse(row.geometry);
        return row;
      }));
    }
  })
});
```

API SQL queries

After a line is drawn on the Leaflet map with Leafleat Draw, the coordinates of the line are inserted into the request ($
format. The line is in WGS84 (EPSG4326) and needs to be converted to RDNew(EPSG28992) in order to extract
other data at the right location.

Code Snippet 4. The line

```
    WITH line AS
  -- Create line geometry
  (SELECT ST_Transform(ST_GeomFromText($1 , 4326), 28992) AS geom),
```

The line is then cut into parts of 10 meter and points are generated with its percentage location along the line.

Code Snippet 5. Point and percentage at every 10 m along the line

```
linemesure AS
  (SELECT ST_AddMeasure(line.geom, 0, ST_Length(line.geom)) as linem,
  generate_series(0, ST_Length(line.geom)::int, 10) as i
  FROM line),

points2d AS
  (SELECT ST_GeometryN(ST_LocateAlong(linem, i), 1) AS geom, (i*100/ST_Length(linem))
percentage
  FROM linemesure),
```

This array of points is intersected with the AHN table to ext rat the height value for every point.

Code Snippet 6. Get height per point

```
AHN AS
-- Get DEM elevation for each
  (SELECT p.geom AS geom, ST_Value(ahn.rast, 1, p.geom) AS heights, percentage
  FROM ahn, points2d p
  WHERE ST_Intersects(ahn.rast, p.geom)),
```

Also the points are intersected with the field names table to see if a points falls into a field, and wchih name and cate
to.

Code Snippet 7. Get field name for intersecting points

```
fields AS
    (SELECT naam AS naam, code_1_ AS category1, code_2 AS category2, ST_Intersection(
veldnamen2.geom) AS geoms
            FROM veldnamen2, points2d p
            WHERE ST_Intersects(veldnamen2.geom, p.geom)),
```

Then the points are intersected with the water topology table to see if a points falls into a water body, and wich name
belongs to.

Code Snippet 8. Get field name for intersecting points

```
--Get Water inersects
waters As
(SELECT naamnl AS waternaam, typewater AS typewater, identifica AS waterId,
ST_Intersection(p.geom, water.geom) AS geomz
FROM water, points2d p
WHERE ST_Intersects(water.geom, p.geom)),
```

In the end all point that fall into a field or water body are joined to the total amount of points to contain the whole range

Code Snippet 9. Join all outcomes

```
points AS
(SELECT *  FROM AHN LEFT OUTER JOIN fields ON (AHN.geom = fields.geoms)),
points1 AS
(SELECT * FROM points LEFT OUTER JOIN waters ON (points.geom = waters.geomz))
```

This is all send back as one complete GeoJSON response.

Code Snippet 10. final GeoJSON response

```
-- Make points:
SELECT ST_AsGeoJSON(ST_MakePoint(ST_X(ST_Transform(ST_SetSRID(geom, 28992),4326)),
ST_Y(ST_Transform(ST_SetSRID(geom, 28992),4326)), heights))
AS geometry, naam, heights, percentage , category1, category2, waternaam, typewater,
FROM points1
```

Eventually the response of the request will be a GeoJSON. An example of the GeoJSON array is shown in asdsa.

Code Snippet 11. Example GeoJSON response

```
[
  {
    "geometry": {
      "type": "Point",
      "coordinates": [
        6.6089395293246,
        53.0818691708253,
        8.05700016021729
      ]
    },
    "naam": "Zuurpol (de)",
    "heights": 8.05700016021729,
    "percentage": 0.826035566357403,
    "category1": "A1",
    "category2": null,
    "waternaam": null,
    "typewater": null,
    "waterid": null
  },
  {…},
  {…},
  {
    "geometry": {
      "type": "Point",
      "coordinates": [
        6.62981923722014,
        53.0856490864126,
        4.8439998626709
      ]
    },
    "naam": "Gryze Steen",
    "heights": 4.8439998626709,
    "percentage": 55.5813292359005,
    "category1": null,
    "category2": null,
    "waternaam": null,
    "typewater": "meer, plas, ven, vijver",
    "waterid": "NL.TOP10NL.128375900"
  },
  {…}
]
```


3.2.5. Web design

Will be an inductive process. Mostly based on the researchers' preferences. The language in the product will be Dutch a part of the Netherlands and the target group is dutch. Internet mapping applications, is software that enables a dev view geodata and maps in a standard internet protocols and run in in a normal browser.

Licenses

Only use of free and open source software is used.

Map5

Technology

HTML, CSS to build the webpage and the interactivity with JavaScript .

Packages needed for building the geo-application will be leaflet and d3.js. And possible leaflet plugins like, Leaf
MiniMap. Leaflet is a JavaScript library for the creation of interactive maps by the founders of OpenStreetMap. Interes
probably the focus on desktop and mobile web browsers, and its use of HTML5. (Steiniger and Hunter 2013)

Technological advancements, such as browsers that support scripting languages natively, and standards, such as Ca
(CSS), Asynchronous JavaScript and HTML 5,

Leaflet

Code Snippet 12. Leaflet map initializing

```
var basemaps ={
  "_1830": L.tileLayer('http://s.map5.nl/map/gast/tiles/tmk_1850/EPSG900913/{z}/{x}/
  "_2015": L.tileLayer('http://{s}.tile.openstreetmap.org/{z}/{x}/{y}.png'),
  "Hoogte": L.tileLayer('http://s.map5.nl/map/gast/tiles/relief_struct/
EPSG900913/{z}/{x}/{y}.jpeg')
}

var map = new L.map('map', {
  maxZoom: 15,
  minZoom: 12,
  layers: basemaps._1830
});

map.setView([53.079529, 6.614894], 14);
map.setMaxBounds([
  [52.861743, 6.458972],
  [53.202277, 6.958035]
]);
```

D3, data driven documents.

Code Snippet 13. D3 request coordinates and drawing transect path

```
d3.json('transect?linestring=' + coordinates, function(json) {
  var line = d3.select("#line")
  line.selectAll(".transect")
    .data(linestring)
    .enter()
    .append("path")
    .attr("class", "transect")
    .attr("d", lineFunction(json))
    .attr("stroke", "#2B2118")
    .attr("stroke-width", 3)
    .attr("fill", "none");
});
```

3.3. Testing the web-application

Third, a small test will be held to see if the product complies with the set goals and objectives. During the whole proces
visualization was adjusted and tested again until the project ends.

The final test will be conducted with a small questionnaire. About 20 people will be asked to open the web-applicati
it and play around with it. Afterwards, 8 statements will be given and asked to rate them to the level of agreeing or n
number of 1 and 5, from totally disagreeing till, total agreeing. Because the objectives were used in defining the stat
application lives up to the objectives set for the user.

Because there is not a official testing group available, the participants will be colleagues of the Waag Society, the h
the Heritage and Location project and possible, classmates and/or family and friends. This to have a broad general pu

Table $$ shows the statements asked and their relation to the objectives. The complete questionnaire can be found in

Table 5. Questions and Objectives

Objective	Statement	
1	1 A	I think the application is visually appealing.
2	1 B and 1 C	I feel tempted to use the tools and functions in the application multiple times.
3	1 C	I feel tempted to use this application multiple times (in the future)
4	2 A and 2 C	The meaning and origin of the field-names became clear to me.
5	2 B	The shown information is surprising and interesting.
6	2 C	By using this application I understand more about the importance of safe-guarding the fi cultural heritage.
7	3 A	The application is simple to use.
8	3 B	Everything was working as I expected.

Chapter 4. Results

4.1. Theoretical framework

First, a literature research is done into geo visualization techniques and already available methods which are applicab
Describing the field-name data in the kind of data it is and the visual variables which can be linked to them. This to c
make the application attractive, and 2c, understanding the geo-data.

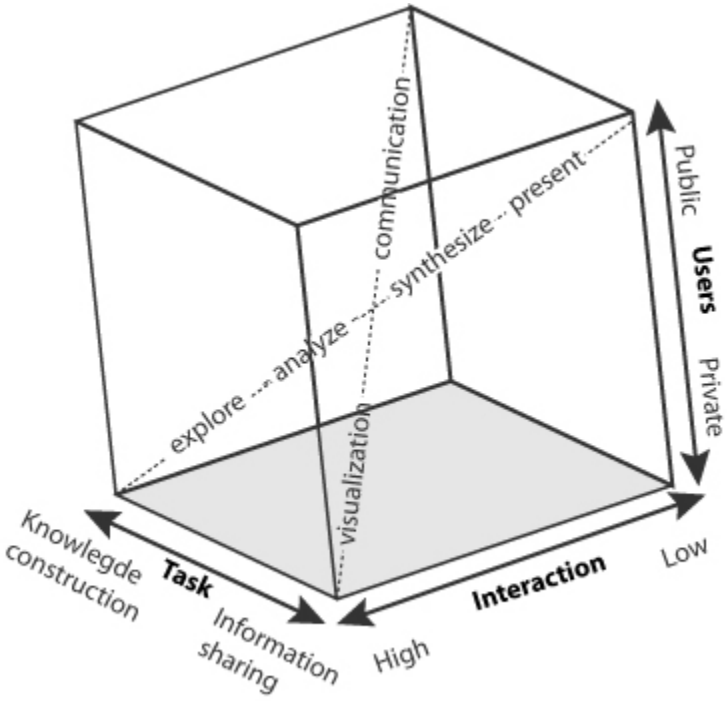
Second, literature about building geo-web applications and the available techniques will be consulted. To cover objec
3 to add knowledge and experience from preceding research to the techniques which will be used here.

Last, will be looked at some frameworks explaining how to build an efficient, attractive and interactive web-application i
on a user centered design. Covering objectives, 1a, 1b and 1c.

4.1.1. Visualization of field-names

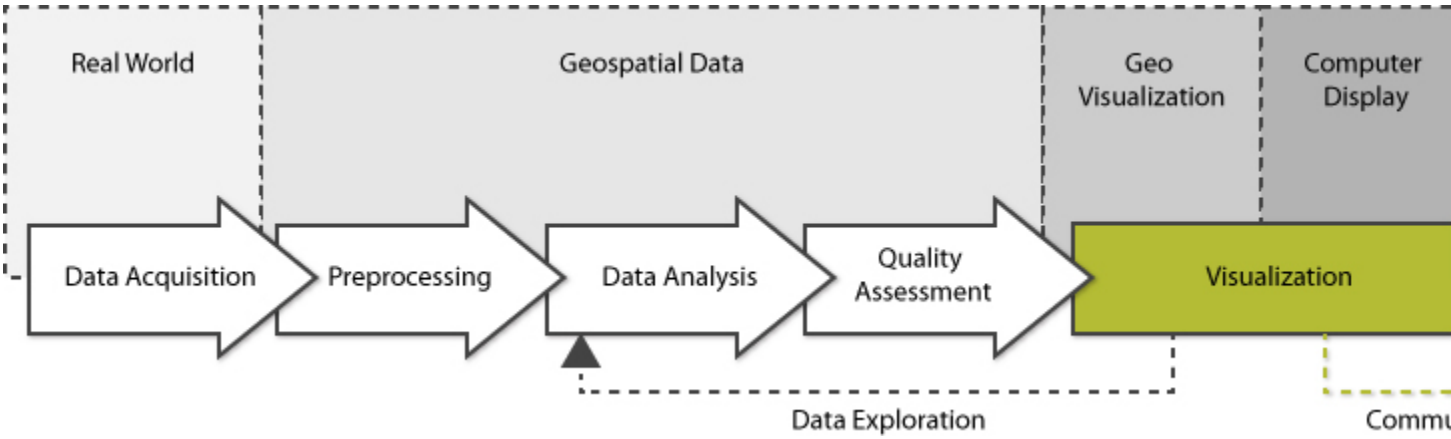
Geographical visualization can be used for 2 purposes; data exploration and information display. (Cartwright et al., 2
graphic representations new knowledge can be created and this can be distributed by visual communication. The one
visual communication is explanatory. (Dibiase, Maceachren, Krygier, & Reeves, 1992) Showing the field-names in an i
is explanatory visual communication. The goal of the field-names is explanatory, while the interactivity makes the da
looking at the Map use Cube of MacEacharen and Kraak, the field name application can be placed in the top corn
about sharing information to a general and broad public. While making it interactive and so exploratory.

Figure 14. Map use cube from MacEachren and Kraak



In figure $$$ the geo processing chain is combined with the series of visualization transformations. Showing tha visualization as exploration and communication. Here we will focus on the visual information communication. To tu understandable knowledge on the explanatory level with a user-centered design. For the fieldnames the data collecti previous studies. For this study only specific data transformations were required and so little data analysis was done. the communication for creating knowledge.

Figure 15. Geo processing chain and visualization series



The field-name data sets are static data, but will be displayed dynamically and interactive. It will let the user explore information themselves, called *guided discovery*. (Nöllenburg, 2007)

The standard technical functionalities for the map to become interactive are:

- Interactive: Zoom, filter, preform queries, different level of details.
- Be able to navigate, zoom, scroll and pan.
- Change thematic data

Field-name polygon., heigh data as line

Brushing used to highlight the hight on the line and the position on the map of that specific point. Multiple views with same information.

Multiple layers, form which the user can choose. Navigation controls available.

Hidden information, which can be *discovered*

The user is no longer depended on what the cartographer puts on the map. (Ogao & Kraak, 2002) With electronic navigate and explore the spatial data themselves with the given functionality. In a dynamic interactive visualization, t between data presentation and exploration. (Ogao & Kraak, 2002) Knapp(1995) defined four visualization operation ta identify, locate, compare and associate. Identify is describing an object, locate indicates the search for a object whose know. Associate and compare is the ability to relate between two different objects.

Table 6. Visualization operators from Ogao & Kraak

Alt text *(Ogao & Kraak, 2002)*

4.1.2. Web based geo visualizations & user centered maps

A user interface for a web page should have the following basic components:

- Geo browser – the map. Spatial dimension. Let users navigate.
- Time bar – temporal dimension.
- Filters – selecting information, filter. Thematic dimension.

The field names are historic but do not contain a change in time. Therefore the time bar had no relevance in the appli

For making the map, Web Map software was needed to create a map in the browser. Some possible Web Map Fram
used and are widely known are OpenLayers, MapFish and Leaflet.(Steiniger & Hunter, 2013) They will be elaborated
application makes use of Leaflet.

OpenLayers is a library for WMS (tiled layers) and WFS (vector layers). It implements a JavaScript API for visualiza
the web browser. Without a server-side component. (Steiniger & Hunter, 2013) (http://openlayers.org/)

MapFish, is an open source web mapping framework for building rich web-mapping applications. MapFish provic
creating web services that allows querying and editing geographic objects. (Steiniger & Hunter, 2013) (http://mapfish.

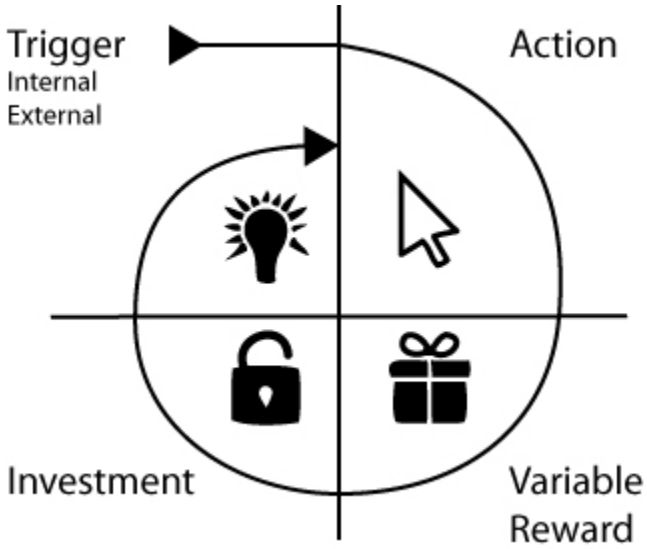
Leaflet is a web-map service WMS,that returns geo-referenced rasterized maps or tiles. In this context a map i
dimensional visualization of features in the common formats jpeg or tiff. Leaflet is open-source JavaScript library
(http://leafletjs.org)

Leaflet currently compete with OpenLayers only with respect to the display of map tiles, because OpenLayer
functionality when it comes to interactive and vector-based map- ping tools. Also MapFish provides much more capa
not needed for this application, the choice was made for using Leaflet, being light and simple.

Leaflet also has the applicability to install plugins. For letting the user change the background map, the MiniMap plugi

4.1.3. User centered designs or Customer engagement

To engage the target group into the application, the hook model is followed. This models explains how a user can b
online product. First there is a trigger, to make the user want to use the application. This could be either an external (e
or internal trigger. When using the product, the user can makes actions for which they have to be rewarded. If a user
they will likely stay and keep using the system, for they already put time and effort in that particular system. With
investments the user will go through the process again, for they get internal triggers to perform more actions.



In the field-names application the external trigger would be given by heritage institutions or environmental institutions. I
about what interesting information there is to find about the Drentse surroundings. This could be in newsletter, pamp
websites or even commercials. When on the site the trigger is the button, to press and go to the map. The action
the map of the users personal interest. After this the transect line is drawn and a lot of interesting information is disp
explore. This is called the reward. So in order to make the reward worthwhile, the information and transect line have t
enough and contain interesting and surprising information. For the long term a investment in the field-name applicatio
of own field-names. So people that know some old field-names or have current names for particular areas of their nei
them and save them to the system. Contributing to the conservation of the living heritage of field names.

4.2. The web application

The web application can be found on: $$$$$ Some screenshots of how it looks:

Figure 16. Welcome screen

<<<<<<<

Wat zijn veldnamen?

De tijd ligt niet eens zover achter ons dat veldnamen een vanzelfsprekend onderdeel vormden van de leefomgeving van veel dorpsbewoners. Het platteland was als het ware gestoffeerd met een rijk geschakeerd kleed van veldnamen. Of het nu een akker betrof, een stuk groenland of opvallende plek, alles had een eigen naam. We spreken dan ook van een namenlandschap dat naast het geografische en het landbouwkundige landschap een plek op de kaart heeft veroverd.. Veldnamen lichten een tipje van de sluier op die over het dagelijks bestaan in vroegere tijden hangt. Ze reiken ons informatie aan over de inrichting van een deels nog woest en ledig land schap, Zo zijn ze ons behulpzaam bij het ontcijferen van de geheimtaal die een dorpslandschap van soms eeuwen terug in zich draagt.

Veldnamen zijn te vergelijken met onze huidige straatnamen. Ze hadden in het agrarische werkdorp een praktisch nut in de communicatie en in de ruimtelijke oriëntatie. Samen vormden ze de basis voor een mentale kaart van het dorpslandschap. De veldnamen riepen daarin als ijkpunten allerlei associaties, betekenissen en voorstellingen op. Waar ze uit het dagelijkse gebruik verdwenen, zijn in veel gevallen de verhalen erover nog springlevend.

In de twintigste eeuw, vooral in de tweede helft ervan, zijn het Nederlandse landschap en het gebruik ervan fundamenteel veranderd. Grootschalige ruilverkavelingen, intensieve landbouw, de urbanisatie van het platteland en natuurontwikkeling hebben de oude cultuurlandschappen weggevaagd, en deze ontwikkeling gaat nog dag in dag uit door.

Aandacht voor de oude toponiemen, de veldnamen waarmee we een oud en zelfs prehistorisch landschap kunnen ontdekken. Er

Hoe

Met deze knop ka

Eindig de lijn do

Nu wordt jouw hoo
Ontdek de namen

Figure 17. Map status in beginning


Zuider esch
Stijfveen
Wester esch
Nieuwe
Vries
Oester esch
6 m
Akenveen (de)
Hagenkamp (de)

Figure 18. Map functionalities with mouseover.


Zuider esch
Stijfveen
Westeresch
Nieuwe
Vries
Tjnaarloo
Oosteresch
5 m
Hagenkamp (de)
Akenveen (de)

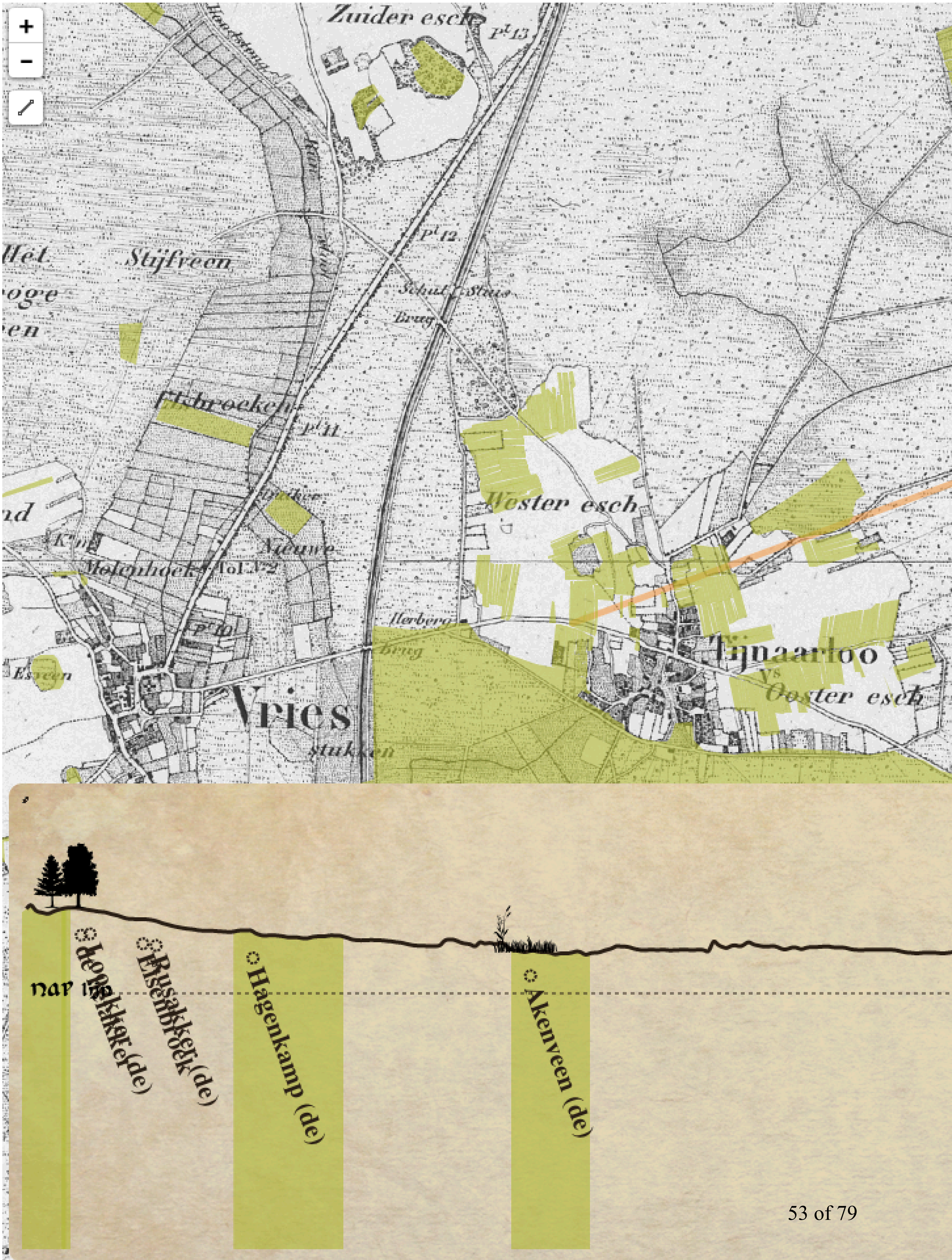

Zuider esch
Stijfveen
Schut Sluis
Brug
Wester esch
Nieuwe
Molenhoek
Herberg
Brug
Vries
stukken
Tijnaarloo
Ooster esch
Hagenkamp (de)
Akenveen (de)

Figure 19. Map drawing a line funciton

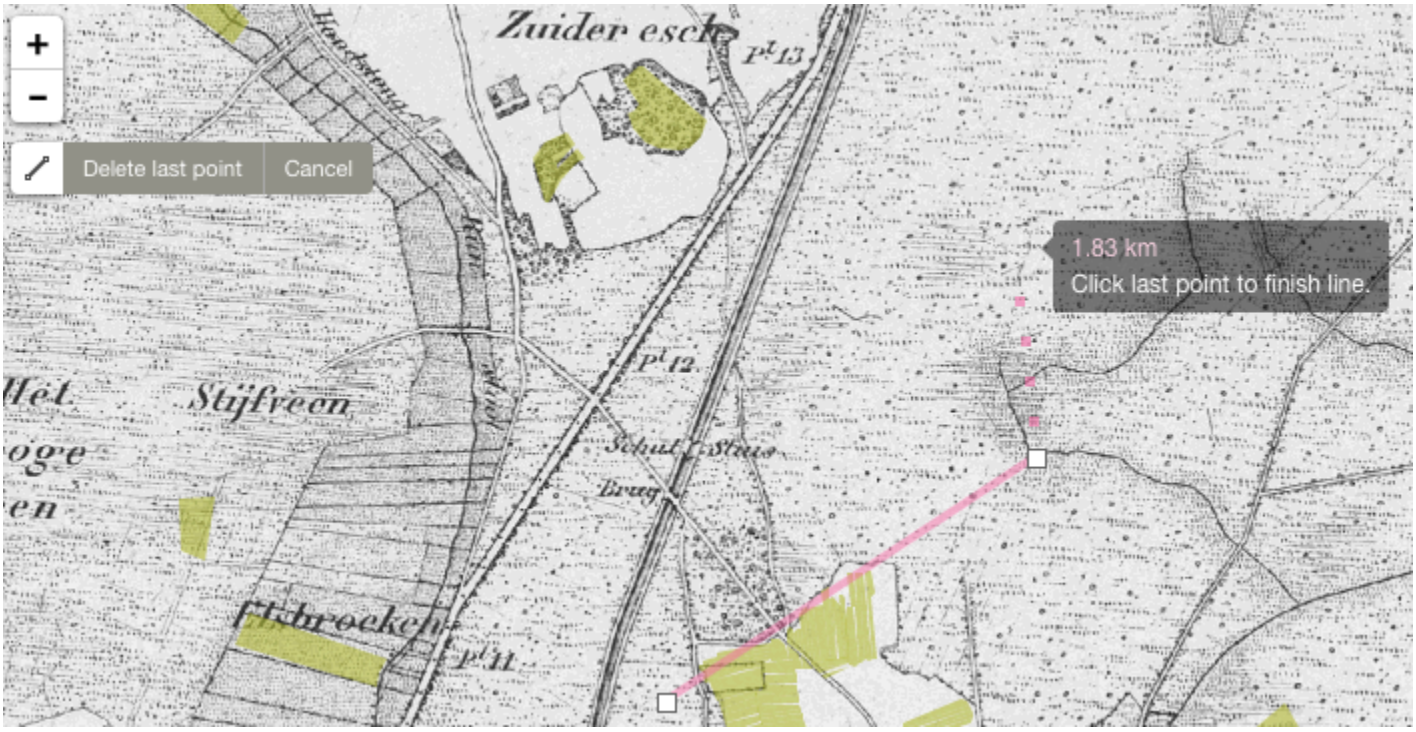


Figure 20. Example interesting spot

Screen Shot 2015 07 21 At 11.06.45 AM Screen Shot 2015 07 24 At 2.18.47 PM

Figure 21. Map status in beginning

Screen Shot 2015 07 24 At 2.19.22 PM

Figure 22. Map functionalities with mouseover.

Screen Shot 2015 07 24 At 2.20.01 PM Screen Shot 2015 07 24 At 2.19.42 PM

Figure 23. Map drawing a line funciton

Screen Shot 2015 07 24 At 2.20.20 PM

Figure 24. Example interesting spot

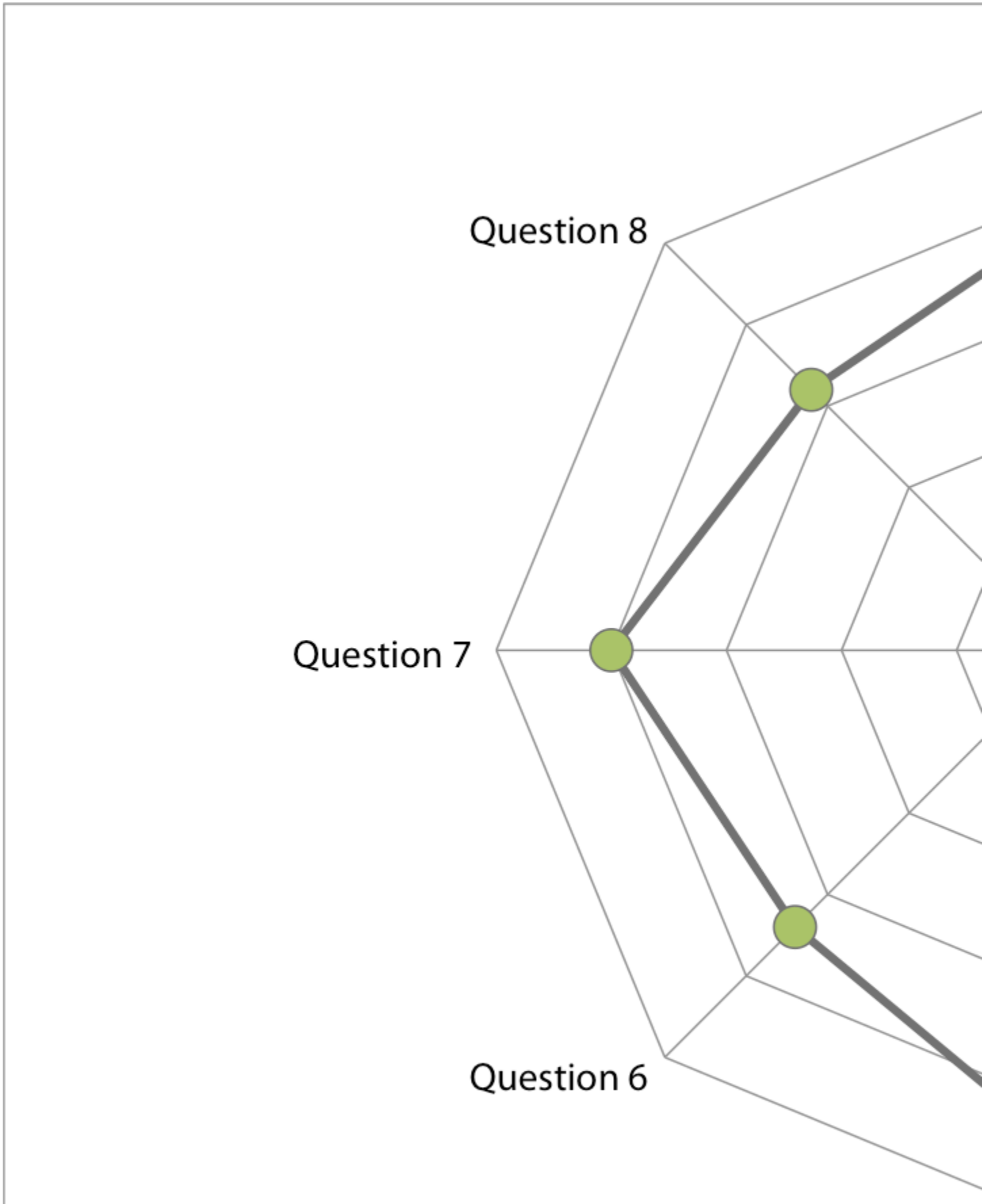
Screen Shot 2015 07 21 At 11.06.45 AM

e5894b926c1f0167fcef85bf23565c4396b5e32a

4.3. Testing the web-application

4.3.1. Outcome questionnaire

$$ people were asked to use the application and fill in the small questionnaire. The graph below shows the outcor
With 5 being positive and 1 being negative. Question 2 about if people were triggered to perform multiple actions wa
positive. Also question 5 if the user found the information surprising and interesting scored high. Meaning that the appli
interesting and the user lingered around to discover more. Question 8 got the lowest score, the functionality did not wo
expect.


Question 8
Question 7
Question 6

total answer overview see appendix $$$.

4.3.2. Remarks on the questionnaire

- "works logical, though information is missing"
- "Make the pop-up disappear when the mouse moves away"
- " I miss a total overview of the page"
- "Finish line, not working.. "
- " The elevation graph should follow the x,y of mouse instead of following just x"
- " text window sometimes conflicts with the layer selector"
- "cursor on the map synchronies with the moving circle on the line"
- "also point selection, not only line"
- Ugly button on the introduction page
- I would like to know more about the different map layers
- drawing button for the line is hard to find
- While waiting, put a waiting sign.
- You would expect the information about the field to pop up when the moving circle is on the field, instead of t

Chapter 5. Discussion

- Too much ideas for such a short time span. Not enough knowledge for the conducting researcher in this shor
- Not enough knowledge of design or technical construction.

Lack of professional knowledge about the data

Design Geo-visualisation is so broad and there are so many ways in which a dataset can be described that it is not framework in steps to follow.

Geo data visualisation Height is the recent height, is this still the same as in 1830?? A lot has changed since.

water areas smoothed out.

No temporal dimension added.

Scale is needed

Not the best way to visualize the correlation which the field-names have to their surrounding.

more specific stories needed behind the fieldnames.

Testing - questionnaire no experience. Maybe too positively asked. 5 levels might be giving the people an opportunity is no saying. The participants are influenced by that they like heritage and understand the project in the bigger pic biased. Not enough participants.

usefull comments. though no time to implement them.

Chapter 6. Recommendations

6.1. Website recommendations

Add more symbols and information behind it. Make the application suitable for multiple browsers. Let the user invest a field and add a field name. Implement more of the thought up ideas to make it more interesting.

Chapter 7. Conclusion

Chapter 8. References

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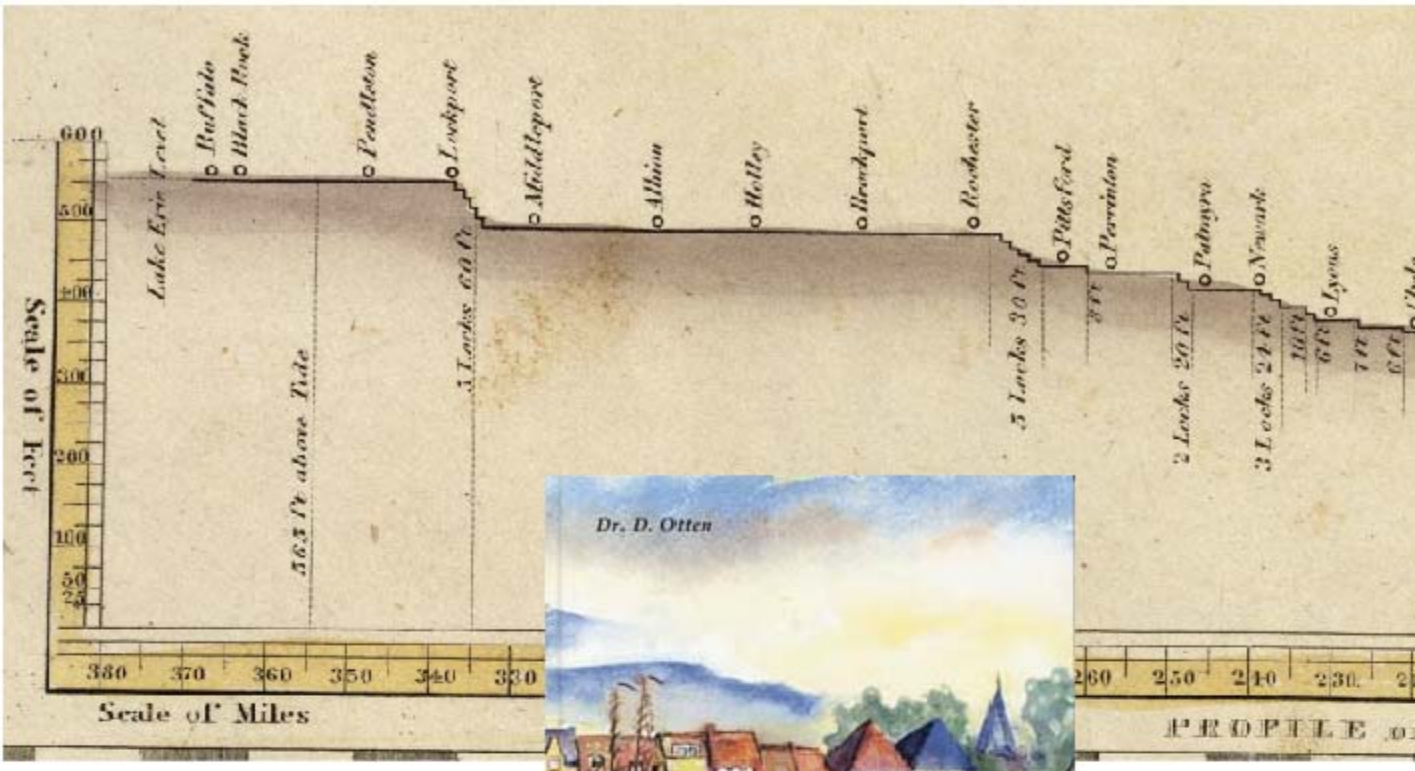
Chapter 9. Appendix

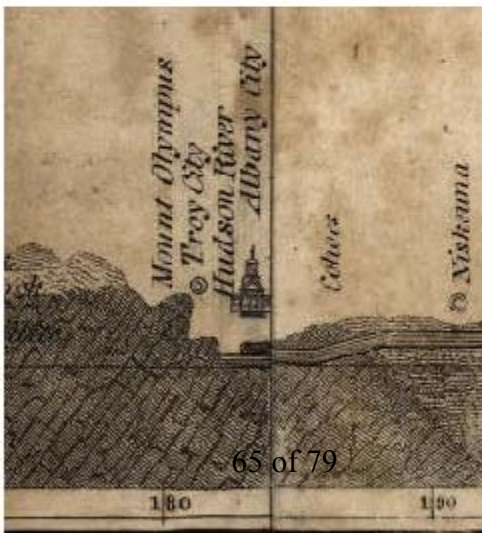
9.1. Mood board


Lake Erie Level
Buffalo
Black Rock
Pendleton
Lockport
Middleport
Albion
Holley
Brockport
Rochester
Pittsford
Perinton
Palmyra
Newark
Lyons
363 ft above Tide
Scale of Feet
Scale of Miles
PROFILE


Dr. D. Otten
Oorsprong, betekenis en gebruik van veldnamen in de gemeente Elburg
Met medewerking van F.J. Bakker
Foto's van J. Hoeksma


KAMPEN
VOORSTE ESCH
18
HOLEN BERG
VOORSTE KNIJPE
16.8
STEENKAMP
ESCH
17.8
ACHTERSTE KNIJPE
ACHTERSTE
18.1
ESCH
21.3
BALINGER
19.8
16.2
17.7
17.4


Ceylon
C. Comorin
Adams Peak 6650
Table-land of Deccan
3200
Valley of the Nerbudda
The Vindhya Chains
Table-land of Malwa
Plains of Hindustan
SEA


Mount Olympus
Troy
Hudson River
Albany City
Schenectady
Vischnawa
180
190

VELDNAME

Veldnamen

Veldnamen

9.2. Categories field-names form RCE

Categorie	Categorie_code	Lemming_Code	Lemming	naam alternatieven
Relief	A	A1	berg	bergen, bergje, barg
Relief	A	A10	leest	
Relief	A	A11	richel	
Relief	A	A12	duin	dun, dunne
Relief	A	A13	dal	daal, del, dil
Relief	A	A14	kuil	koel
Relief	A	A15	waard	weerd
Relief	A	A16	kwab	kweb, kwebbe, kwabbe
Relief	A	A17	gat	
Relief	A	A18	put	
Relief	A	A19	laag	laagen, laagte, leeg, lege
Relief	A	A2	bult	bulten, bulte, bultje, bultien
Relief	A	A20	val	
Relief	A	A21	plat	
Relief	A	A22	vlak	vlakte, vlakkien
Relief	A	A23	hol	
Relief	A	A24	glij	glijt, gleet, gleed
Relief	A	A3	hoog	hoge, hoogte, heugt, heugte
Relief	A	A4	hoorn	Horne, hörne, heurn
Relief	A	A5	hel	helle
Relief	A	A6	hul	hulle
Relief	A	A7	pol	
Relief	A	A8	hoog	
Relief	A	A9	nor	norre
Bodem	B	B1	zand	sand
Bodem	B	B10	grijs	grijze, grauw
Bodem	B	B11	ele	
Bodem	B	B12	bruin	bruun
Bodem	B	B2	leem	
Bodem	B	B3	veen	
Bodem	B	B4	klei	
Bodem	B	B5	steen	stien, stein
Bodem	B	B6	kei	kai, kaai
Bodem	B	B7	zwart	
Bodem	B	B8	wit	
Bodem	B	B9	rood	rode
Waternamen	C	C1	meer	
Waternamen	C	C10	wiel	waal
Waternamen	C	C11	zee	
Waternamen	C	C12	vals	valsch
Waternamen	C	C13	weier	weiert, weijert
Waternamen	C	C14	veentje	veentie
Waternamen	C	C2	poel	
Waternamen	C	C3	dobbe	
Waternamen	C	C4	streng	
Waternamen	C	C5	diep	
Waternamen	C	C6	beek	beeck
Waternamen	C	C7	water	
Waternamen	C	C8	kolk	
Waternamen	C	C9	leek	
Beekdal_Moeras	D	D1	broek	broeken, broekje
Beekdal_Moeras	D	D10	gagel	
Beekdal_Moeras	D	D11	moor	moer, moerde
Beekdal_Moeras	D	D12	goor	gor
Beekdal_Moeras	D	D13	sleek	slijk
Beekdal_Moeras	D	D14	rus	rusch
Beekdal_Moeras	D	D15	geel	gele
Beekdal_Moeras	D	D16	slob	slom
Beekdal_Moeras	D	D17	eis	
Beekdal_Moeras	D	D18	schol	scholte, school, schel
Beekdal_Moeras	D	D19	sek	sekke
Beekdal_Moeras	D	D2	maat	made, maad, maadje
Beekdal_Moeras	D	D3	mars	
Beekdal_Moeras	D	D4	vledder	vleer, vlier, fleer, flier
Beekdal_Moeras	D	D5	stroet	stroot, stroe
Beekdal_Moeras	D	D6	hem	ham
Beekdal_Moeras	D	D7	horst	hurst, haarst, harst
Beekdal_Moeras	D	D8	oel	uil
Beekdal_Moeras	D	D9	riet	reit, raait, reet
Bossen	E	E1	loo	lo, ook-elen-ele
Bossen	E	E10	haag	hagen, heeg, heg
Bossen	E	E11	els	elze, eller, elder
Bossen	E	E12	hulst	huls
Bossen	E	E13	den	denne
Bossen	E	E14	es	esch, asch
Bossen	E	E15	wilg	ween, wene, wede, wee, warff, warve, werff, we
Bossen	E	E16	eik	eek, ekkel, eck
Bossen	E	E17	hazel	hessel
Bossen	E	E18	struik	stroek
Categorie	**Categorie_code**	**Lemming_Code**	**Lemming**	**naam alternatieven**
Bossen	E	E19	bramen	brummel
Bossen	E	E2	hees	heeze, heze
Bossen	E	E20	meidoorn	hageldoorn
Bossen	E	E21	doorn	
Bossen	E	E22	bosbes	kreus, kreuzen, krös, krözen
Bossen	E	E23	zwartebosb	bliek, blik
Bossen	E	E24	bessen	
Bossen	E	E25	roos	rosen, rozen
Bossen	E	E26	stok	stock
Bossen	E	E3	stobbe	stob
Bossen	E	E4	bos	bosch, busch
Bossen	E	E5	hout	
Bossen	E	E6	holt	
Bossen	E	E7	laar	
Bossen	E	E8	wold	woold
Bossen	E	E9	strubbe	
Veldgrond_stuifzı	F	F1	veld	velt
Veldgrond_stuifzı	F	F10	lijsterbes	kweekeboom
Veldgrond_stuifzı	F	F2	heide	heide, heet, hiet
Veldgrond_stuifzı	F	F3	haar	hare
Veldgrond_stuifzı	F	F4	zuring	
Veldgrond_stuifzı	F	F5	woest	
Veldgrond_stuifzı	F	F6	wild	wilden, wildernis
Veldgrond_stuifzı	F	F7	ruig	roege
Veldgrond_stuifzı	F	F8	brem	braam, broam, breem, bram
Veldgrond_stuifzı	F	F9	wind	
Wilde_dieren	G	G1	fazant, pat	hunder, hoender, hoonder
Wilde_dieren	G	G10	valk	
Wilde_dieren	G	G11	kraanvogel	kraan, krane, craan, crane
Wilde_dieren	G	G12	reiger	
Wilde_dieren	G	G13	mus	
Wilde_dieren	G	G14	raaf	raven
Wilde_dieren	G	G15	duif	duiven, duven, doef, doeven
Wilde_dieren	G	G16	mees	meeze
Wilde_dieren	G	G17	ooievaar	ooievaar, heileuver, ooievaar, eiber, scholbos, lu
Wilde_dieren	G	G18	kraai	
Wilde_dieren	G	G19	spreeuw	spree
Wilde_dieren	G	G2	haan	hane
Wilde_dieren	G	G20	hond	hund
Wilde_dieren	G	G21	kat	
Wilde_dieren	G	G22	bever	
Wilde_dieren	G	G23	vos	
Wilde_dieren	G	G24	wolf	wolven
Wilde_dieren	G	G25	haas	hazen
Wilde_dieren	G	G26	konijn	
Wilde_dieren	G	G27	otter	
Wilde_dieren	G	G28	das	
Wilde_dieren	G	G29	adder	edder
Wilde_dieren	G	G3	uil	oel
Wilde_dieren	G	G30	mug	
Wilde_dieren	G	G31	luis	luizen
Wilde_dieren	G	G32	bij	iemen, ymen, yemen
Wilde_dieren	G	G33	bloedzuiger	egel, iegel
Wilde_dieren	G	G34	aal	alen
Wilde_dieren	G	G35	vis	visch
Wilde_dieren	G	G4	ekster	aakster, okster
Wilde_dieren	G	G5	kievit	kiewiet, kieft
Wilde_dieren	G	G6	eend	ent
Wilde_dieren	G	G7	gans	ganzen, gaans, gaanzen, goos, gozen, goes
Wilde_dieren	G	G8	snip	
Wilde_dieren	G	G9	leeuwerik	
Overig	O	O1	sassen	
Overig	O	O10	wed	wet
Overig	O	O11	dansel	
Overig	O	O12	walg	

Lemming Code	Category	Category Code	Lemming	Name Alternativ
A1	Relief	A	berg	bergenlbergjelbarg
A10	Relief	A	leest	
A11	Relief	A	richel	
A12	Relief	A	duin	dunldunne
A13	Relief	A	dal	daalldellldil
A14	Relief	A	kuil	koel
A15	Relief	A	waard	weerd
A16	Relief	A	kwab	kweblkwebbelkwabbe
A17	Relief	A	gat	
A18	Relief	A	put	
A19	Relief	A	laag	laagenllaagtelleegllege
A2	Relief	A	bult	bultenlbultelbultjelbultien
A20	Relief	A	val	
A21	Relief	A	plat	
A22	Relief	A	vlak	vlaktelvlakkien
A23	Relief	A	hol	
A24	Relief	A	glij	glijtlgleetlgleed
A3	Relief	A	hoog	hogelhoogtelheugt
A4	Relief	A	hoorn	Hornelhörnelheurn
A5	Relief	A	hel	helle
A6	Relief	A	hul	hulle
A7	Relief	A	pol	

A8	Relief	A	hoop	
A9	Relief	A	nor	norre
B1	Bodem	B	zand	sand
B10	Bodem	B	grijs	grijzelgrauw
B11	Bodem	B	ele	
B12	Bodem	B	bruin	bruun
B2	Bodem	B	leem	
B3	Bodem	B	veen	
B4	Bodem	B	klei	
B5	Bodem	B	steen	stienlstein
B6	Bodem	B	kei	kailkaai
B7	Bodem	B	zwart	
B8	Bodem	B	wit	
B9	Bodem	B	rood	rode
C1	Watermen	C	meer	meren
C10	Watermen	C	wiel	waal
C11	Watermen	C	zee	
C12	Watermen	C	vals	valsch
C13	Watermen	C	weier	weiertlweijert
C14	Watermen	C	veentje	veentie
C2	Watermen	C	poel	
C3	Watermen	C	dobbe	
C4	Watermen	C	streng	
C5	Watermen	C	diep	
C6	Watermen	C	beek	beeck

C7	Watermen	C	water	
C8	Watermen	C	kolk	
C9	Watermen	C	leek	
D1	Beekdal_Moeras	D	broek	broeken|broekje
D10	Beekdal_Moeras	D	gagel	
D11	Beekdal_Moeras	D	moor	moer|moerde
D12	Beekdal_Moeras	D	goor	gor
D13	Beekdal_Moeras	D	sleek	slijk
D14	Beekdal_Moeras	D	rus	rusch
D15	Beekdal_Moeras	D	geel	gele
D16	Beekdal_Moeras	D	slob	slom
D17	Beekdal_Moeras	D	eis	
D18	Beekdal_Moeras	D	schol	scholte|school|schel
D19	Beekdal_Moeras	D	sek	sekke
D2	Beekdal_Moeras	D	maat	made|maad|maadje
D3	Beekdal_Moeras	D	mars	
D4	Beekdal_Moeras	D	vledder	vleer|vlier|fleer|flier
D5	Beekdal_Moeras	D	stroet	stroot|stroe
D6	Beekdal_Moeras	D	hem	ham
D7	Beekdal_Moeras	D	horst	hurst
D8	Beekdal_Moeras	D	oel	
D9	Beekdal_Moeras	D	riet	reit|raait|reet
E1	Bossen	E	loo	
E10	Bossen	E	haag	hagen|heeg|heg
E11	Bossen	E	els	elze|eller|elder

E12	Bossen	E	hulst	huls
E13	Bossen	E	den	denne
E14	Bossen	E	eschlasch	
E15	Bossen	E	wilg	weenlwenelwedelweelwarfflwar
E16	Bossen	E	eik	eeklekkelleck
E17	Bossen	E	hazel	hessel
E18	Bossen	E	struik	stroek
E19	Bossen	E	bramen	brummel
E2	Bossen	E	hees	heezelheze
E20	Bossen	E	meidoorn	hageldoorn
E21	Bossen	E	doorn	
E22	Bossen	E	bosbes	kreuslkreuzenlkröslkrözen
E23	Bossen	E	zwartebosbeslblauwebosbes	blieklblik
E24	Bossen	E	bessen	
E25	Bossen	E	roos	rosenlrozen
E26	Bossen	E	stok	stock
E3	Bossen	E	stobbe	stob
E4	Bossen	E	bos	boschlbusch
E5	Bossen	E	hout	
E6	Bossen	E	holt	
E7	Bossen	E	laar	
E8	Bossen	E	wold	woold
E9	Bossen	E	strubbe	
F1	Veldgrond_stuifzand	F	veld	velt
F10	Veldgrond_stuifzand	F	lijsterbes	kweekeboom

F2	Veldgrond_stuifzand	F	heide	heidelheetlhiet
F3	Veldgrond_stuifzand	F	haar	hare
F4	Veldgrond_stuifzand	F	zuring	
F5	Veldgrond_stuifzand	F	woest	
F6	Veldgrond_stuifzand	F	wild	wildenlwildernis
F7	Veldgrond_stuifzand	F	ruig	roege
F8	Veldgrond_stuifzand	F	brem	braamlbroamlbreemlbram
F9	Veldgrond_stuifzand	F	wind	
G1	Wilde_dieren	G	fazantlpatrijs	hunderlhoenderlhoonder
G10	Wilde_dieren	G	valk	
G11	Wilde_dieren	G	kraanvogel	kraanlkranelcraanlcrane
G12	Wilde_dieren	G	reiger	
G13	Wilde_dieren	G	mus	
G14	Wilde_dieren	G	raaf	raven
G15	Wilde_dieren	G	duif	duivenlduvenldoefldoeven
G16	Wilde_dieren	G	mees	meeze
G17	Wilde_dieren	G	ooievaar	ooievaarlheileuverlooievaarleibe
G18	Wilde_dieren	G	kraai	
G19	Wilde_dieren	G	spreeuw	spree
G2	Wilde_dieren	G	haan	hane
G20	Wilde_dieren	G	hond	hund
G21	Wilde_dieren	G	kat	
G22	Wilde_dieren	G	bever	
G23	Wilde_dieren	G	vos	
G24	Wilde_dieren	G	wolf	wolven

G25	Wilde_dieren	G	haas	hazen
G26	Wilde_dieren	G	konijn	
G27	Wilde_dieren	G	otter	
G28	Wilde_dieren	G	das	
G29	Wilde_dieren	G	adder	edder
G3	Wilde_dieren	G	uil	oel
G30	Wilde_dieren	G	mug	
G31	Wilde_dieren	G	luis	luizen
G32	Wilde_dieren	G	bij	iemenlymenlyemen
G33	Wilde_dieren	G	bloedzuiger	egelliegel
G34	Wilde_dieren	G	aal	alen
G35	Wilde_dieren	G	vis	visch
G4	Wilde_dieren	G	ekster	aaksterlokster
G5	Wilde_dieren	G	kievit	kiewietlkieftlKieviet
G6	Wilde_dieren	G	eend	ent
G7	Wilde_dieren	G	gans	ganzenlgaanslgaanzenlgooslgo
G8	Wilde_dieren	G	snip	
G9	Wilde_dieren	G	leeuwerik	
O1	Overig	O	sassen	
O10	Overig	O	wed	wet
O11	Overig	O	dansel	
O12	Overig	O	walg	
O13	Overig	O	alk	halk
O14	Overig	O	hartzeer	
O15	Overig	O	buis	

O16	Overig	O	helmer	
O17	Overig	O	staart	
O18	Overig	O	vlas	
O2	Overig	O	bol	
O3	Overig	O	viool	violen
O4	Overig	O	distel	disselldiesel
O5	Overig	O	bloem	
O6	Overig	O	ronsel	
O7	Overig	O	mos	
O8	Overig	O	klaver	
O9	Overig	O	groen	
W1	Wind	W	oost	ooster
W2	Wind	W	noord	noorder
W3	Wind	W	west	wester
W4	Wind	W	zuid	zuider

9.3. AHN tiles downloaded:

ahn2_5_07cz1.tif ahn2_5_12en1.tif ahn2_5_07cz2.tif ahn2_5_12en2.tif ahn2_5_07dz1.tif ahn2_5_12ez1.ti
ahn2_5_12ez2.tif ahn2_5_11fz2.tif ahn2_5_12fn1.tif ahn2_5_12an1.tif ahn2_5_12fn2.tif ahn2_5_12an2.t
ahn2_5_12az1.tif ahn2_5_12fz2.tif ahn2_5_12az2.tif ahn2_5_12gn1.tif ahn2_5_12bn1.tif ahn2_5_12gn2.ti
ahn2_5_12gz1.tif ahn2_5_12bz1.tif ahn2_5_12gz2.tif ahn2_5_12bz2.tif ahn2_5_12hn1.tif ahn2_5_12cn1.ti
ahn2_5_12cn2.tif ahn2_5_12hz1.tif ahn2_5_12cz1.tif ahn2_5_17bn2.tif ahn2_5_12cz2.tif ahn2_5_17en1.ti
ahn2_5_17en2.tif ahn2_5_12dn2.tif ahn2_5_12en1.tif ahn2_5_12dz1.tif ahn2_5_12en2.tif ahn2_5_12dz2.t
ahn2_5_12fn1.tif ahn2_5_12ez2.tif

9.4. R sript converting files to shapefile.

```
filenames <- list.files()
filenames <- list.files(filenames , pattern = "*.TAB" ,full.names = T)

## x = list of folder files # cat = category folder
exportToShape <- function(x, cat){
  for(i in 1:length(x)){
      name <- x[i]
      nr <- strsplit(name, "/")
      layer <- substr(nr[[1]][2], 1, nchar(nr[[1]][2])-4 )
      lemming <- substr(nr[[1]][2], 4, nchar(nr[[1]][2])-4)
      file <- readOGR(name, layer)
      file$category <- cat
      file$lemming <- lemming
      writeOGR(obj = file, dsn = "shape_vlak", layer = layer, driver = "ESRI Shapefil
overwrite_layer = T)
  }
}
exportToShape(filenames, "overig")
```

9.5. R script detecting categories

```
  library(sp)
  library(raster)
  library(rgdal)
  library(rgeos)
  require(RPostgreSQL)
  require(rgdal)

  setwd("/Users/waag/Documents/MGI_Stage/9_veldnamen/10_VeldnamenOrgineel/")

  # csv alle categorien en Lemmings
  categorie <- read.csv(file = 'Categorie_Alles.csv', header = T , sep=","   )

  # shapefile alle velden + namen
  velden <- readOGR(dsn = '/Users/waag/Documents/veldnamen.shp', layer = "veldnamen",
stringsAsFactors = F)

  # write shapefiel back
  writeOGR(obj = velden, dsn = "veldnamen_cat.shp", layer = "veldnamen_cat", driver =
Shapefile")

  # modifing shapefile
  velden$CODE_1[velden$CODE_1 != NULL] <- velden$ATOTO_CODE
  ## correctie
  velden$CODE_1[velden$CODE_1 == "D02"] <- "D2"
  velden$CODE_1[velden$CODE_1 == "E04"] <- "E4"
  velden$CODE_1[velden$CODE_1 == 'G03'] <- "G3"
  velden$CODE_1[velden$CODE_1 == "B03"] <- "B3"
  velden$CODE_1[velden$CODE_1 == "G06"] <- "G6"
  velden$CODE_1[velden$CODE_1 == "G07"] <- "G7"
  velden$CODE_1[velden$CODE_1 == "A01"] <- "A1"
  velden$CODE_1[velden$CODE_1 == "D03"] <- "D3"
  velden$CODE_1[velden$CODE_1 == "D06"] <- "D6"
  velden$CODE_1[velden$CODE_1 == "O08"] <- "O8"
  velden$CODE_1[velden$CODE_1 == "O02"] <- "O2"

  ## categorien toevoegen
  i <- 0
  j <- 0

  for( i in 1:length(velden$NAAM)){
    naam <- velden$NAAM[i]
    for( j in 1:length(categorie$Lemming)){
      CODE <- categorie$Lemming_Code[j]
      tekst <-  paste(categorie$Lemming[j],"|",categorie$amaltertieven[j] , sep = ""
      geld <- grepl(tekst, naam, ignore.case=T)
      if(geld){
        if(is.na(velden$CODE_1[i])){
          velden$CODE_1[i] <- paste(CODE)}
        else if(is.na(velden$CODE_2[i])){
```

```
          velden$CODE_2[i] <- paste(CODE)}
      }
      print(paste(naam, tekst, CODE, geld))
    }
  }
```

9.6. Questionnaire for testing the application

Alt text