The Dutch National Atlas in a GII environment: the application of design templates

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1. Introduction

The current information revolution causes a tremendous increase of physical, socio-economic and environmental data. These amounts can only be made accessible, and allowing for both insight and overviews by special presentation techniques such as mapping, tabular or diagrammatic presentations. Society reacts therefore to this new trend with ever increasing numbers of maps. This has both positive and negative aspects.

This tremendous increase in maps, either available through national geospatial data infrastructures, though geo-services, or through more traditional means such as paper maps and atlases, allows for a quick understanding, possibilities for analysis (also with the help of GIS techniques), combination with other datasets of the geospatial data provided. We are able to download more maps than ever from the web, and it must be surmised that more people than ever use this geospatial information. As cartographers we are not sure yet that they would be using it correctly, but then we were never sure either whether this was the case in the past in a more traditional information-providing environment.

For the web-wise, national topographic mapping series, satellite imagery, national atlases, road maps and town plans can be downloaded free of charge, and the material on offer suggests that at least Western Europe is currently getting closer to the situation in the US where all geospatial information collected by the government on national level is made available free of charge. The Cadastral survey of the Netherlands started 10 years ago by making available its ledgers and maps to notaries at a charge; nowadays everyone can download these charts and information about average prices in the mapped area [https://www.vindjeeigenhuis.nl].

That may sound very well, but at best, it is only a mixture of maps that is provided. These maps have no joint basis, or datum, and are therefore difficult to compare, let alone be

useful for producing a synthesis of the data. Despite the fact that we have clearing houses available for accessing geospatial information, it is not easy to get an overview of data availability, let alone data compatibility. It should be possible have maps that can be made at the Central Bureau of Statistics website [http://statline.cbs.nl/StatWeb/Help/nl/helpmap.htm] combined with soil maps that can be downloaded from the Alterra Soil Survey [http://www.bodemdata.nl/]) or with risk maps produced by our provincial authorities that show the risk of either explosions, gasses escaping from plants or the getting on fire and that would thus contribute to the evaluation of prospective abodes and willingness to invest in such premises [http://geocement.esrinl.com/risicokaart_pub/mrk_pub_utrecht.html].

All users of geospatial information had atlases when they were first confronted with this kind of data. At school they were taught how to deal with them through the concepts that the school atlases were based on: areal and thematic subdivisions, map comparison, geo-referencing, datums, etc. So it is logical when confronting geospatial information to go for an atlas metaphor. These school atlases might not be detailed or extensive enough to allow for all our information needs, so we would select the most detailed atlas, the national atlas, as our starting point. It is the most important geospatial inventory of all (physical, socio-economic and environmental) geospatial datasets available for an area, that have been processed to make them comparable, so that the atlas can function as a decision making tool. Of course it is not just the atlas information it would give access to, but also the underlying datasets and - when functioning as a geoportal, also to all other related datasets made available by the national geospatial data providers. Thus, it offers these data providers also a 'presentation outlet'. The main benefits of having the national atlas as the portal towards the nation's geospatial information are: ease of use because of familiar concepts and ease of access because of the topical atlas structure.

2. The National Atlas of the Netherlands

Although the first actions to produce a national atlas started already in 1929, it was only after WWII, due to the global economic crisis in the 1930s and the decision to first produce a national atlas of Indonesia, that the first edition of the Netherlands national atlas materialised (1963-1978). To that end a Foundation for the Scientific Atlas of the Netherlands was set up in 1958, backed by the Ministry of Education, the Royal Netherlands Geographical Society, the Topographic Survey and universities. An Atlas Bureau was set up at the national physical planning agency, paid for by the Ministry of Education. This atlas was an inventory of all geospatial data, perhaps more targeted at the area than at its inhabitants. A most detailed soil map 1:250 000 formed its backbone, but it is difficult to perceive it as a narrative of the country, more as an incidental combination of contributions from various fields of science.

In the second edition, published 1989-1995, this was mended and this edition is clearly centred on the inhabitants of the country and only deals with aspects of the sciences (climate, geology, soil, etc) when this was deemed relevant for explaining the way Dutchmen provided for themselves. So the atlas contained no geological maps per se, but maps of economic geology or of the strata from which natural gas could be mined. The Atlas Bureau, transferred to the national mapping agency, could continue its ministry-backed work for the production of this second edition, but when it was completed the

Ministry's outlook had changed, claiming that from now on such endeavours as a national atlas should be self-supporting, and resulting in the atlas bureau' closing.

This left a destitute Foundation, with the copyright to its two national atlas editions as its only asset, but with the strong will to continue the work on a national atlas as such a decision-making support tool was regarded as a necessity for a densely inhabited country (500inh/km2) beset by new waves of migrants, and with ferocious competition between different types of land use. The first objective of the foundation was to keep the national atlas concept alive, and to this end it was decided to make all maps from the previous two editions available on the web [http://avn.geog.uu.nl/]. With 1,5M hits since mid 2000 this website seems to answer the needs of high school pupils that have to do projects as well as the geospatial information needs of a larger informed audience. But, as the information contained in these scanned maps is getting out of date, new initiatives were needed. One was updating the current maps, and at Utrecht University this is currently done in the framework of a geography student project. Another is to try to revive the national atlas bureau.

The challenge then is to have a national atlas bureau imbedded in the national geodata infrastructure, based on the recognition that a central place where all different geospatial datasets are made comparable, and that can moreover function as a most useful geoportal, is needed. A government-financed project is currently under way to build a prototype of such a portal. The authors of this paper make up the project's research team, and the Cadastre, as the major player in the Netherlands geospatial infrastructure is targeted as a potential host of such a bureau. As datasets of all different government organisations have to be dealt with, a near autonomous bureau is regarded as the best structure.

Its objectives would be to:

- Use the geodata and geo-services available via the GDI to create (interactive and well designed) atlas maps. The various data sets provided would be made comparable, and be visualized according to specific templates
- Apart from acting as any map in a national atlas, these maps would also function as an alternative entry to the GDI. It is meant here not only that they should be clickable and provide the underlying statistics used, but also that by zooming in on a specific area and taxonomy level in the atlas all the data sources for that query combination could be accessed via hyperlinks

After an initial period in which the structure and design aspects are defined, and in which procedures and data-exchange protocols are regulated with data providers, staff of a lean atlas bureau would be able to provide a continuous stream of well-designed maps, relevant and up-to-date, with which to fill the national atlas website. Through this interesting geo-information offer it would attract increased numbers of people interested in the nation's geo-information, but simultaneously allow them to access other geospatial information items provided through the nation's GDI

The technology to use has recently been elaborated by a PhD study in which the concept suggested in this paper was developed, allowing for searching and browsing modes that could also access underlying GDI information (Aditya and Kraak 2006; Aditya and

Kraak 2007). The organisational framework would depend on our ability to convince the national geospatial data providers to make their data accessible and comparable through this gui, and their subsequent realisation that the atlas would thus provide for added value apart from providing an extra presentation outlet.

The atlas would be targeted primarily at the highest forms of high school (through its ready-made maps) as well as to more professional users (that would use the atlas as geoportal to get at data they would consecutively map themselves. The exact scenario how to position the national atlas or the atlas bureau in the Dutch geodata infrastructure is still being studied.

National atlases have functioned always as means for showing the extent of our geospatial knowledge for specific areas: as current geospatial knowledge inventories, they have made visible the gaps in our knowledge (Ormeling 1979; Ormeling 1993). Because of the need of permanently manned atlas bureaus to sustain national atlas production, the very concept is under pressure; examples are the national atlas information systems in the United States and in Canada, both suffering from a lack of funding. In Germany the realization of the National Atlas has been a war of attrition, claiming most of the time of the atlas editor. In both France and Italy after the production of the national atlas the responsible organisations were disbanded. Even if resurrected after some decades, the investment loss in knowledge and expertise is incredible. Reversely, having a national atlas also contributes immensely to the visualisation of geospatial information; the Netherlands e.g. witnessed a real renaissance of its commercial atlas production after publication of its national atlases.

3. International developments

Many countries have a national atlas. The first national atlas dates from 1899 when the Finland created the atlas to define their national identity while under occupation. Many nations followed this example with similar or other nationalistic and scientific reasons in mind. Traditionally these were books. Today national atlases are found both as books and as digital publication on dvd or the Internet (Sieber and Huber 2007).

Although both book and dvd type of atlases have their advantages they are basically closed systems, and only current at the time of publication. Online versions have as additional advantages that they are easily accessible via the web and have no distribution costs. In the digital version the user can have access to the data behind the map, but the online user also expects up-to-date information at all times. Digital versions can have analytical functionality added but the online version allows for more combinations because they can function as a geoportal as well and as such be automatically embedded in the national geodata infrastructure. It is in the context of these geoportals that the national atlas can assist in improving accessibility to the geodata infrastructure, because current geoportals often have a high level of abstraction and are lacking support and functionality when searching. Currently the atlases of Canada and the United States are such online national atlases.

The Canadian atlas [http://atlas.nrcan.gc.ca/site/index.html] has an history of more then hundred years and evolved from a traditional paper bound atlas to an full online atlas.

The first maps where on-line in 1994. It's role is defined as 'to present topical and issue-based information in a geographical context, through maps' (Kramer 2007). In the design of the atlas a user centered approach has played an important role. Identifying and studying user groups by looking at the visitors of the early web atlas and having discussion with them showed that the main user groups are found in the educational domain and with individual with a great interest in particular subjects. In this contact with the user their satisfaction was measured and has helped to define the access to content, the interface functionality and the structure of the atlas. It proved that the understanding of the behaviour of the user as ell as their needs played a role in the evolution of the different online versions over the last decades. It also became clear that the atlas user in general differs from the GDI users. Currently the atlas offers web map services for thematic maps and via toporama also for topographic maps.

On the website of the national atlas of the United States [http://www.nationalatlas.gov/] which was started in 1997, it is worded that 'like its predecessor, this new atlas provides a comprehensive, map like view into the enormous wealth of geospatial and geostatistical data collected for the United States. It is designed to enhance and extend our geographic knowledge and understanding and to foster national self-awareness'. The predecessor was an atlas book published in 1970. The content of the online atlas is partly based on data availability and might look rather random when compared with traditional national atlases a proposed by Salichev in the past. The website has a consistent interface to guarantee visitors where to find certain categories of maps and data. Interestingly is that most users just want a map (to look at, for download or to print) and are not necessarily interested in the mapmaker section where users can compile their own maps. The sustainability is, as in most country not easy, especially in a country where one has to answer the questions why the government should make an atlas when private industry can do it as well?

4. Design strategies

The development of the National Atlas interface focuses on three principles. First the Atlas will provide for a uniform interface to the Dutch GDI where specific attention is paid to well-designed maps. Providing an overview is more important than in-depth analysis, which limits the scale of the maps. Second, the Atlas will have a modular design and therefore be able to serve different groups of users. And last but not least the user should experience 'instant satisfaction' using the Atlas. Speed while loading and manipulating the maps and a clear and easy to use interface are essential to achieve this goal. The interface of the National Atlas will eventually include two components, an editor's interface and a user interface. The editor's interface, a tool to manipulate maps and data, will be developed later on. Figure 1 shows the schematic layout of the atlas.

The user interface basically has three windows, each divided in two panes. The window on the left side contains a list of topics and a search module. The window in the middle contains a toolbar and map area, and the window on the right side contains the key and the storyteller, where the user will find additional information to the map. The panes of the interface (except the toolbar) can be resized by dragging bars (see Figure 2).

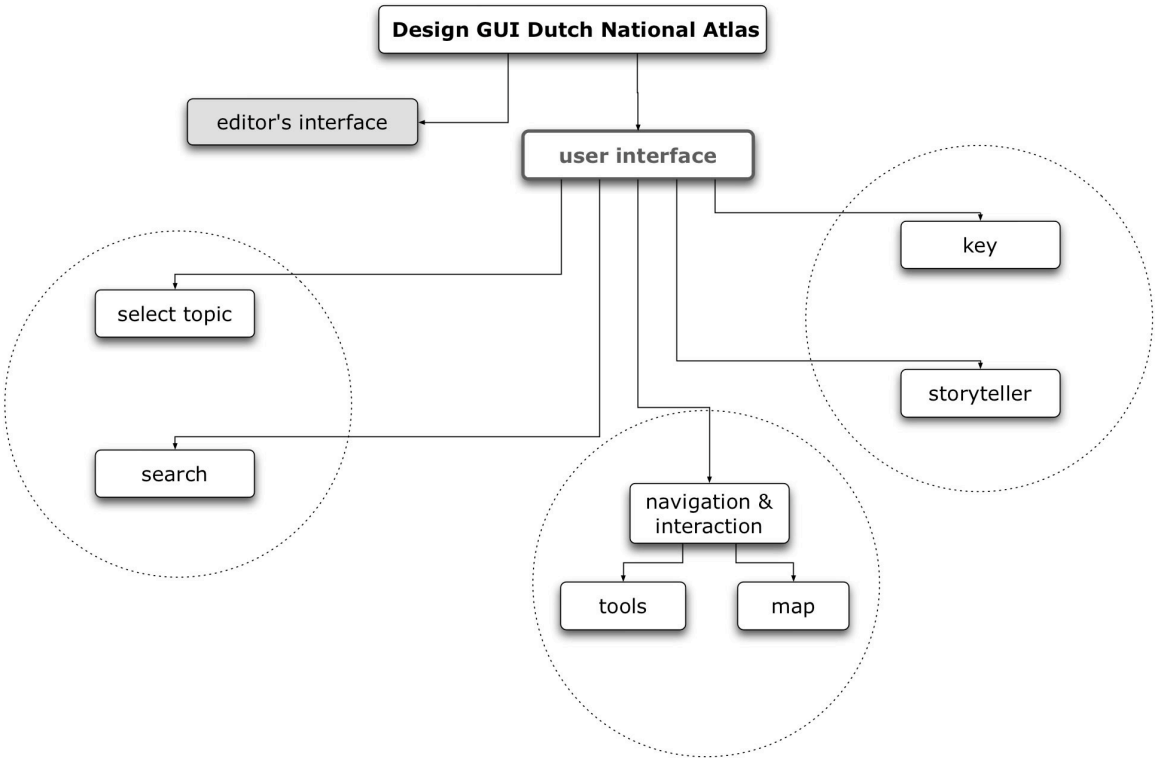

Figure 1 Schematic layout web pages of the National Atlas of the Netherlands

Figure 2 Generic layout webpage (see also www.geografiek.nl/anderen/nationaleAtlas/interactief)

4.1 Selection of a topic and the search pane

On entering the atlas, a default map is automatically shown. The topic of this map may for instance pay attention to current events and should change regularly. To browse through the Atlas one can either search by keyword or location, or click one of the predefined topics from a list. For more elaborate search operations the search pane has a link to an advanced search pane. Here one can create queries using a combination of keywords and location, exclude certain keywords or locations plus specify a timeframe for the topic one is interested in. In the pane below the search pane, a taxonomic list is also giving entrance to the Atlas. For selecting more than one topic at the time, one can link to an expert pane where this is possible. The visualization of multiple subjects chosen from the list of topics has, taking into account the nature of the chosen topics, three options. The topics can be displayed on top of each other in one map, displayed in two maps next to each other, or after each other as an animation or slideshow. On selecting a topic, a link to the producer of the data underlying the specific topic is shown in the storyteller.

4.2. The toolbar and map area

The toolbar at the top of the map area contains several easy recognizable pictograms giving access to zooming, panning and printing operations. Here one can also click a help-button for more information on how to use the atlas, while an additional button offers access to more tools like measuring and exporting the map or underlying data in a

desired format. A tool-tip explains the functionality of a buttons when the cursor moves over. Clicking the 'more tools' button not only gives access to more tools, but also affects the way in which the user can manipulate the map and thus entering an 'expert mode'. In a movable pane one can for instance turn layers off and on or enter thresholds. The map area can contain raster or vector images, or a combination of both. The maps in vector-format will offer interactivity like clicking on an area shows additional information of that area in the tool-tip or in the storyteller pane. The design of the map cannot be manipulated. The visualization of the maps will be predefined in style-sheets to maintain consistency in design throughout the Atlas. In case of overlaying two topics however the alpha of the upper layer and the saturation of the underlying layer can be manipulated.

4.3 Key and storyteller

The key to the map will explain its content, the internal identification and show elements of external identification such as the title of the map, the scale, source and copyright. Depending on the type of map the key will be more or less complicated. The storyteller is a window where all kind of additional information can be found. Here the modular design of the Atlas becomes very apparent and functional. In the standard modus one can take an atlas tour, which will guide the user through the Atlas in a sequence comparable to a paper atlas. By selecting topics from the list one can move from one topic to another whereby the accompanying storyteller will have a link for reading further on the matter, and thus entering the expert modus of the atlas.

5. Technical implementation

From a technical perspective the implementation of the new Dutch national atlas should adhere to the open source standards as set by the open geospatial consortium and as recommended by the W3C. These constraints and the fact that the atlas should function in the context of the national geodata infrastructure resulted in a setup as shown in figure 7. The configuration has two layers at the server side and on layer at the client side. At the server side data and metadata are found and the processing services offered by the providers and the atlas. The visualization takes place at the client side. The 'data layer' contains internal geodata and non-geodata. These are basic atlas map layers with for instance boundaries files, text, images and charts that support map themes. The external data is of course not stored at the atlas server but retrieved from data providers. This can be non-geodata, for instance statistics from the census bureau or road data from the ministry of public works. Metadata summaries describe these datasets. The processing services 'layer' refers to the web services offered by providers, and could by Web Feature Service (WFS) or Web Map Services (WMS). The atlas has a data integration component that can integrate the data offered by the services. The role of the data integration component is which mapping put is suitable and which design templates are required when handling services from outside the atlas. Java-servlets are used in this component to support RDF queries with a SPARQL implementation and. [http://www.w3.org/TR/rdf-sparql-query/]. For this purpose the atlas directory is used as a reference that enables the atlas to combine external services with internal geodata and non-geodata. It also holds the mapping component that 'translates the data into visualizations based on design templates as described before. Once the mapping output and required template are defined the data is displayed on the client side. Here the

visualization is realized either via Flash or SVG. In addition it is possible to offer the maps in DHTML and use the OpenLayers 'viewer' [http://www.openlayers.org/] that allows the 'mapping' of atlas content on top of other applications such as Google Maps.

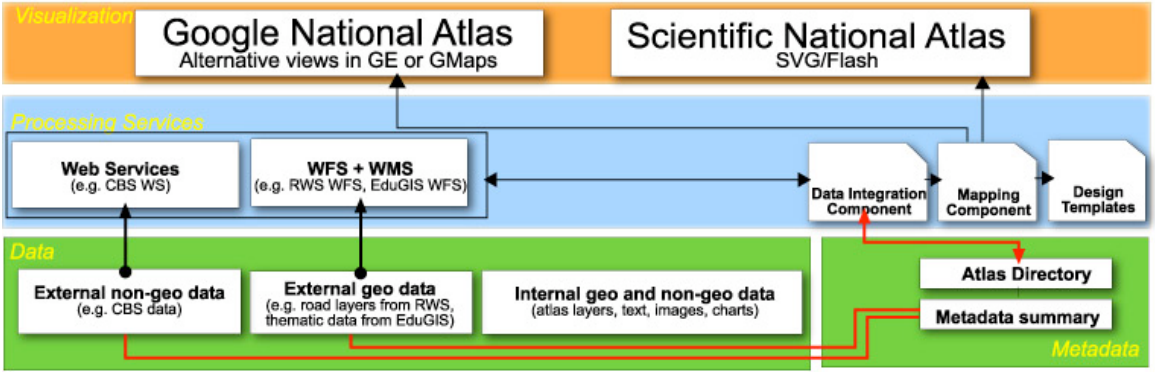

Figure3. Technical implementation of the national atlas in the national geodata infrastructure

5. Outlook

The first objective after having proved the feasibility of the prototype developed under a government grant (RGI) is to demonstrate this to national data providers and convince them of the added value of the use of the national atlas as such and as an interface to the geospatial information available. One of these organisations with ambitions to become the nation's geospatial data provider will consecutively be targeted for implementation of this GUI on its website. The history of clearing houses for geospatial information and geoportals in the Netherlands has until now not been a prime example of good geo-information management, and it is hoped the national atlas gui will prove to be a viable alternative.

Linked to serving as a host to the gui comes housing the national atlas bureau. As indicated above this should entail 1 fte staff commitment, after the initial structures, protocols and deals with other spatial data providers have been dealt with. This light weight map editor office or atlas bureau, apart from editing maps and regularly extending the number of ready-made maps available through the site, should keep tabs on both the new geospatial information being made available by national providers as well as taking account of the changing needs and interests of the general public and of professionals.

The general public we are addressing is increasingly able to express its own geospatial information in digital form, thus wanting to integrate this in current maps. Community mapping is a good example of this trend, as is the gps-based survey of road networks. Parallel to this increased ability of the public to deal with geospatial data is their increased inability to deal with the abstraction imposed by our traditional mapping techniques, such as planimetric, generalised presentations subjected to specific projections.

As this general public has got used to 3D weather forecasts on the news, and is now able to portray its own information against a background of satellite imagery draped over 3-D models, as in Google Earth or in similar services by other providers, it expects the less abstract portrayal of the Earth surface that these services can provide as well as their ease of overlaying datasets. This entails for our intended atlas-based geoportal also a service linked to Google-Earth to visualise the ready-made maps against a more nature-like background.

For professionals working with geospatial information the ease of accessing and combining geo-spatial datasets through the national atlas interface can be harvested in geo-collaboration. Here multiple users at different locations can address and amend the same image on line in planning sessions or emergency situations, deciding interactively with the shared cartographic image as medium, on the course to take. Way beyond its static and almost per definition outdated information provision image, the national atlas information system is getting a new lease of life!

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